

REMOTE
READING

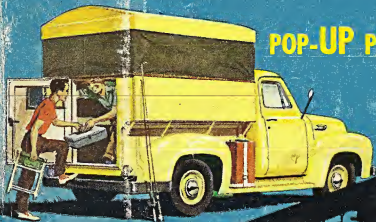
Electronic Fishing Thermometer

SCIENCE and MECHANICS

35c - AUGUST

- \$20 Room Cooler
- SAAB Test
- Removing Car Dents

POP-UP Pickup Camper



FOLD
OUT

BONUS BLUEPRINTS

- ★ Underwater Metal Locator
- ★ Sport POWERCYCLE

also Detachable Cart
for Power Scooters



AUGUST 1960

SCIENCE and
MECHANICS 35 CENTS

"THE MONEY-SAVING WAY TO MAKE YOUR CAR GLITTER AND GLEAM AGAIN" — CAR LIFE MAGAZINE

REPLATE AUTO CHROME

RIGHT ON YOUR CAR —
WITH PERMANENT PLATING

BRING BACK NEW-CAR BRILLIANCE

Here at last is the car-owner's answer to all chrome problems... a way that you can do actual **ELECTROPLATING** right on your own car. You put a brand-new, shiny plating on bumpers, grille, all auto trim. You bring back new beauty and sparkle to your car... **INCREASE ITS VALUE**... make yourself proud to own and drive it. With **SPEED-PLATER** you put on new metal as you brush! And the plating you apply becomes an **INDESTRUCTIBLE PART** of the metal you plate... bonds itself on—forms a hard, sparkling, metal surface that defies all elements!

BUMPERS—GRILLWORK—ALL CAR TRIM RESTORED TO NEW BRILLIANCE

Here is how easily you **REPLATE** your car... you simply clamp **SPEEDPLATER'S** wires to your car's battery, then dip **SPEEDPLATE** Brush into the miracle plating solution and plate anywhere around your car—without removing any parts. Safe, mild current works **FAST**—yet uses less battery juice than the tiniest light on your car.

TESTED AND APPROVED BY LEADING AUTOMOTIVE MAGAZINES

MOTOR TREND Magazine, New Products Test, July, 1958: "We deliberately picked a difficult test area which was badly pitted and corroded... Our Plating kit was the **Empire Speed Plater**. The final result matched the chrome and was entirely satisfactory. Anyone should be able to obtain similar results..."

ROD & CUSTOM Magazine, New Products Test, April, 1958: "Speedplater not only can be used to restore scratched, worn or blistered chrome on any part of your car, but can be used to plate metal not chromed before... For those wishing to plate their own items right at home without having to depend upon a commercial chrome shop, we'll vouch for the Speedplater's doing the job by saying that it works exactly as described, giving a lasting, durable, bright coating."

Car Dealers & Service Stations Make Big Profits with Special Heavy-Duty Outfit

Now you can make **TERRIFIC PROFITS** plating right in your own shop—without removing bumpers, grille, etc. Increase value of your used cars! Touch up new cars! Restore worn chrome areas to bright, new sparkle! **Buick Dealer** says: "Wonderful. We had excellent results!" **Heavy Duty Outfit** electroplates on current from standard 12 volt battery. Entire Outfit, **COMPLETE**, only \$34.95. Includes Plating Brush with Permanent Anode, Wires and Clips for Battery Connection, Special Buffing Wheels and Compound, Special Grinding Wheel, Stripping Solution to remove old chromium, Rust Remover, Special Polish, enough Plating Solutions for dozens of cars! You simply make back entire cost on your very first job! Additional supplies always available from us at rockbottom prices. **MONEY BACK GUARANTEE**. Order now. 1P COD, with \$5 deposit.

CASH REFUND IF NOT COMPLETELY SATISFIED



IT PLATES AS YOU BRUSH
*Brings New, Glistening Beauty to
Worn, Dull, even Blistered
Chrome Areas of Your Car.*



MAKE BIG MONEY PLATING

Now you can add to your income during spare-time hours... because 8 out of 10 cars on the road today **NEED REPLATING**. You can charge \$5.00 for touch-up to \$50.00 for replating an entire car.

Plating is fun, too! You'll get a kick out of taking rusted, pitted, worn metal and bringing it back to shining smoothness. When neighbors see the brilliant plating on your car, they'll want you to do the job for them.

And you can plate other things for profit, too... faucets, appliances, tableware, cutlery, tools, doctors' and dentists' instruments... you can get more solutions at low prices any time—also solutions to plate silver, gold and rhodium. There's big money in jewelry and silverplate work! You get **ALL INSTRUCTIONS** for plating with your Speedplater Outfit!

MAIL COUPON NOW—YOU RISK NOTHING

If you want to put new, permanent, gleaming plating on your own car, you can do it right away and not risk a dime. If you are not **COMPLETELY** satisfied with great results, just return your order in 30 days in good condition and get **FULL CASH REFUND**. **ACT NOW!** Here's what you get: **SPEEDPLATER** Brush, with permanent Anode for life time plating; Wires and Clamps for battery hookup; one-up solutions to plate several cars; Special Buffing Wheels and Buffing Compound; Special Metal Polish; Full sample instructions. Just mail coupon with only \$1 deposit, then pay postman \$19.05 plus postage when **SPEEDPLATER** arrives, or send \$14.05 with order and we pay all postage charges. **SAME GUARANTEE EITHER WAY. CASH REFUND IF NOT COMPLETELY SATISFIED.**

EMPIRE MERCHANDISING CO., Dept. SM-860
140 Marbledale Rd., Tuckahoe, N. Y.

Please rush the electroplating kit I have checked.

☐ Regular **SPEEDPLATE OUTFIT**, \$14.95 (if C.O.D. send \$1 deposit).

☐ **Heavy-Duty Service Station Outfit**, \$34.95 (if C.O.D. send \$5 deposit).

☐ I enclose full price, send postpaid.

I understand that I must be **COMPLETELY SATISFIED** or I may return kit within 30 days for immediate **CASH REFUND**.

Name _____

Address _____

City _____

State _____

**YOU Can Prepare Rapidly as
an EXPERT BOOKKEEPER**

FREE SAMPLE LESSON

IF that's what you want, here's something that will interest you—a short course to quickly prepare you for your start in a successful accounting career. Not a magic formula—not a get-rich-quick scheme—but something substantial, and practical.

Of course, you need something more than just the desire. So, wouldn't it be well worth your while to use some of your leisure time in interesting home study—over a comparatively brief period? Always provided that the rewards were good and thousands upon thousands have found it so.

A Bookkeeper's or Accountant's duties are interesting, varied and of real worth to his employer. He has important standing with his employer.

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an Accounting or Bookkeeping position?

Through more than 50 years' experience in training hundreds of thousands of successful accountants, including nearly 5,000 CPA's, we have developed a practical training in sound accounting principles and practices, designed to prepare you rapidly for countless numbers of high-paying bookkeeping and accounting positions.

You, Too, Can Succeed

The success of LaSalle graduates has resulted from their knowledge and application of the principles acquired through Basic and Practical Accounting, Principles of Accounting and Cost Accounting training, offered in our step-by-step accounting plan. Federal Income Tax is included to qualify you for the many opportunities available to bookkeepers and accountants with this valuable knowledge.

Success in mastering the training is assured through the guidance of expert accountants and CPA instructors.

You complete the lessons right in your own home, in your spare time, advancing as rapidly as your time and ability permit. Low cost-easy terms.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really trained. It's possible your employers will notice improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it!

Get Free Sample Lesson—Also "Opportunities in Accounting"

For your own good get all the facts about this short course in modern accounting training. Write for Free Sample Lesson—also latest book "Opportunities in Accounting." They will prove that Accounting offers a brilliant future to you and will show the wide range of opportunities that exist today. No cost or obligation. If you want a position of higher income and greater prestige...MAIL THE COUPON NOW!

**ACCREDITED MEMBER,
NATIONAL HOME STUDY COUNCIL**



LaSalle Extension University

—A Correspondence Institution—

Dept. 860H 417 S. Dearborn St., Chicago 5, Ill.

Please send me, free of all cost or obligation, a sample lesson in Accounting...also, your latest illustrated book, "Opportunities in Accounting."

Name.....Age.....

Address.....

City, Zone, State.....

The Magazine That Shows You How

Features

How Tiros Photographed the World (Including Russia).....	65
Underground Silo for Minuteman.....	69
Converting Your Boat to Water-Jet Power.....	70
Sunlight Powers Automobile.....	74
New RW-3 Multiplane Becomes a Glider.....	75
Tomorrow's Home: Comfort in Cubes.....	79
Parade of New Patents.....	82
Road and Lab Tests: Front-Drive SAAB.....	84
Home Shop Work Savers.....	88
Pantograph Carves in 3-D.....	89
Thermoelectric Generator.....	89
Remarkable New Amphib Camper.....	90
De-Salting Sea Water with A-Power.....	92
Squirrel Cage for Lunar Explorers.....	95
Electronic Leash for Dogs.....	95
Experimental Gearless Tractor.....	96
Thermometer for Angling.....	96
Amphicar Travels Water or Land.....	97
Resonant Bending Tests Pipes.....	97

Cover by PHIL MILLAR

Free Blueprint No. 1

Sports Powercycle with Side Cart.....	122
---------------------------------------	-----

Bonus Blueprint No. 2

Underwater Metal Locator.....	162
-------------------------------	-----

Special Departments

Readers' Round Table

Views, Ideas, Questions and Answers.....	26
--	----

What's New

New Products for Your Consideration.....	42
--	----

Your Workshop and Mine

Chord Organs Galore.....	52
--------------------------	----

(continued on page 4)

ART YOUNGQUIST
Home Workshop Editor

WAYNE WILLE
Feature Editor

BILL CALLAHAN
Automotive Editor

P. D. URBAIN
Associate Editor

WILLIAM J. McHUGH
Associate Editor

GARRY WINTER
Associate Editor

FRED EISENZOPH
Art Director

CHUCK BACHTELL
Assistant Art Director

CURT JOHNSON
Handbook Editor

L. D. LUDWIG
Field Editor

Contributing Editors

THOMAS A. BLANCHARD
R. J. DeCRISTOFORO

NORBERT ENGELS
W. D. JACKSON

RUSSELL P. MacFALL
DOUGLAS ROLFE

HAROLD P. STRAND
JOE H. WHERRY

RAY WHITMAN
RAYMOND F. YATES

Advertising Offices: Chicago: 450 E. Ohio St., WE 4-0330; New York: 557 Madison Ave., PL 3-8771; Los Angeles: The Maurice A. Kimball Co., Inc., 1250 Beverly Blvd., DU 8-9178; San Francisco: The Maurice A. Kimball Co., 681 Market St., EX 2-3365. Single copies, 95¢. Subscriptions in the United States, its possessions and Canada, 12 issues for \$4.00; 24 issues for \$7.00; 36 issues for \$10.00. To all other countries, add \$1.00 for each 12 issues. Remit in U. S. funds.

Published: February, April, June, August, and monthly starting with October. Publication date: First of the month previous to the cover date. Hence, the February issue goes on sale January 1. In reporting change of address, be sure to give both old and new addresses at least six weeks before the date of the issue with which it is to take effect. The post office will not forward copies unless you provide extra postage.

Entered at second class meter March 29, 1937, at the post office at Chicago, Illinois, under the act of March 3, 1879. Entered as second class matter at post office department, Canada. Inscripta como correspondencia de segunda clase en la oficina de Correos de La Habana, Copyright, 1960, by SCIENCE AND MECHANICS PUBLISHING CO., a subsidiary of Davis Publications, Inc. Printed in the U. S. A. All rights reserved. We assume no responsibility for unmailed manuscripts. No manuscripts will be returned to the contributor unless accompanied by sufficient postage.

On material submitted for editorial consideration the contributor warrants: that he is the author or agent for the author; that the manuscript has not been previously sold or published; that the manuscript is being offered exclusively to SCIENCE AND MECHANICS; that the ideas, designs or processes described in the manuscript are original with the author or are presented with the written permission of the originator and/or the patent or copyright holder; that releases have been secured from all persons whose names or from their legal guardians, in the case of minors.

We are not responsible for possible infringement of patents caused by disclosures contained in material published in SCIENCE AND MECHANICS, and advise readers to investigate the possibilities of such infringement before making, using, or selling articles or processes described herein.



Published by
SCIENCE AND MECHANICS
A Davis Publication
450 East Ohio Street, Chicago 11, Illinois



**A HIGHLY
RESPECTED TRADE—
START SOON TO
EARN EXTRA MONEY
IN SPARE TIME**

Learn at Home IN YOUR SPARE TIME to Fix Electrical Appliances

To build a better future, get into a field where there's much important work and the security that comes from knowing a good trade. Servicing electrical appliances offers that **OPPORTUNITY**. Every wired home has many electrical appliances and millions and millions of new appliances are sold every year. Owners pay well to keep them in repair. That's making a fast-growing need for trained men.

job. You can train at home in your spare time for only \$3.00 down and \$6.00 a month. A small price to pay for increased earnings, a more secure future. Paste coupon below on a postal or mail in envelope for free book and sample lesson. Address **National Radio Institute, Dept. DHO, Washington 16, D. C.**

**MAILING THIS
COUPON MAY START
YOU TO SUCCESS
LESSON AND BOOK
FREE**



Add To Your Income Starting Soon Need For Service Technicians Increasing

Make extra money in your spare time. Start soon to fix electric toasters, fans, clocks, vacuum cleaners, and other electric appliances for your neighbors and friends. Work in your basement, garage or spare room. It's easy to increase your earning power—to pay for your training many times over—to have extra money to buy things you need.

Learn and Earn with Multi-Use Tester Built with Parts We Send

This course includes the parts to build a portable, sturdy Appliance Tester that helps you locate electrical defects quickly and easily. You use it to learn and do actual electrical appliance repair jobs. If you want better pay learn this good trade. No need to give up your present

NATIONAL RADIO INSTITUTE, Dept. DHO, Washington 16, D. C.

Please send me Electric Appliance Training lesson and book free. (No salesman will call.)

Name Age.....

Address

City Zone... State.....

ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL

Thrill-ride a new



TRIUMPH

FOR THE FUN
OF IT!

Take a new lease on life! Ride the hottest motorcycles ever built — the "sizzling '60" Triumphs. Whatever you want in a 'cycle, you'll find in a Triumph — speed, power, peak performance and operating economy. There isn't a 'cycle anywhere to keep pace with the exciting 1960 Triumphs.

FREE OFFER

DEPT. YZ

Mail this coupon today for FREE 1960 full-color catalog showing the complete Triumph line and the name and address of your nearest Triumph dealer. Send coupon to nearest address:

In the West:
Johnson Motors, Inc.
267 W. Colorado Street
Pasadena 1, Calif.

In the East:
The Triumph Corporation
Towson, Baltimore 4
Maryland

PLEASE PRINT

Name _____

Street _____

City or Town _____ State _____

Telephone Number _____ Age _____

Learn AUTO REPAIR

IN YOUR SPARE TIME AT HOME!

Start YOUR OWN BUSINESS!

START YOUR OWN BUSINESS

With a Potential Market of 110,000,000 Customers. Over 100,000 Auto Mechanics are needed NOW. New COMPLETE Home Shop Training Program lets you EARN As You LEARN.

Over 100 Professional Auto Tools are Sent you, including Complete tune-up kit with all gauges, socket, ignition, open and closed end wrench sets, steel tool box.

CHRISTY's Complete Training also shows you how to establish your own business, buy parts wholesale.

FREE ILLUSTRATED BOOK

Shows you how you learn every phase of Auto-Diesel Repair. Send today for big FREE book, and special Pay Later form.

CHRISTY TRADES SCHOOL, Dept. B-202
3214 W. Lawrence Ave. Chicago 25, Illinois

TABLE OF CONTENTS

(continued from page 2)

Do-It-Yourself Guides

Helpful Literature You Can Obtain..... 54

Science Briefs

Preview of Tomorrow..... 60

How To Do It

Pivot-Top Desk..... 98

Alumicrafting New Faces on Shop Projects..... 102

Pop-Up Camper..... 105

Bedroom Cooler for \$20..... 112

Shop Kinks..... 114

Collapsible Slat Basket..... 118

Combination Sports and Utility Powercycle..... 122

Four Sliding Jigs Insure Perfect Miters..... 131

Everyday Science

How to Determine Specific Gravity..... 134

Test Your Science Knowledge..... 136

Patents and Inventions

What's Your Patent Question?..... 137

Car Clinic

New Ways to Remove
Cor Dents and Scratches..... 140

Boats

Simplest 3-Pointer, Hasty Hydro..... 146

Radio-TV-Electronics

Electronic Fishing Thermometer..... 154

Crystal Photo-Control Switch..... 158

Inverted Brush Cleans Gun's Tip..... 160

Soldering Flux Dispenser..... 160

Foil Reflects Iron's Heat..... 160

Soldering "Pen" Absorbs Heat..... 161

Film Spools Make Radio Knobs..... 161

Underwater Metal Locator..... 162

Model Craft

Covered Conestoga Wagon..... 171

Your Home and Garden

Bulkheading Your Property..... 176

Ideas for Your Home..... 180

Electricity

His and Hers Lighted Mirrors..... 184

**NOW...GET
EVERYTHING
YOU NEED TO
PREPARE TO EARN
REAL MONEY IN**

ELECTRONICS

**From RADIO • TELEVISION • RADAR
To GUIDED MISSILE CONTROL, etc.**

**One of
Today's
BRIGHTEST
Opportunity Fields!**



Today's great Electronics field offers you a chance of a lifetime to prepare for highly interesting work and a wonderfully promising future! With so many new developments coming up in Electronics, opportunities for trained men were never brighter. Send coupon for details.

Right in your own home you may now get one of today's most interesting . . . **PRACTICAL WAYS** to prepare for a good job or your own business in Electronics. No previous technical experience or advanced education are needed! DeVry Tech brings you a unique **3-WAY COMBINATION** of texts, home movies and real equipment—the same type of basic equipment as found in our well-equipped Chicago and Toronto Laboratories.

EMPLOYMENT SERVICE
... helps you get started toward a good job, or toward advancement in the company you now work for. **FREE** to all graduates.

EARN WHILE YOU LEARN
DeVry Tech's practical program helps you to earn **EXTRA MONEY** in your spare time, servicing Radio and TV sets.

Your Guide to PROFITABLE JOB OPPORTUNITIES

See how **YOU** may get ready for Jobs as:
TV-Radio Broadcast Technician
Color Television Specialist
Radar Operator • Laboratory Technician
Airline Radio Man • Computer Specialist
Quality Control Manager
Your Own Sales & Service Shop... PLUS MANY OTHERS

300 EXPERIMENTS

Build over 300 practical projects from many shipments of Radio-Electronic parts. You build and operate TV-Radio circuits . . . wireless microphones . . . and many other major projects—all designed to provide outstanding practical experience at home.



HOME MOVIES

Thanks to this exclusive home training aid, many important fundamentals quickly become "movie clear." Now you can actually see electrons on the march and aher "hidden actions"—a wonderful advantage that is almost like having a teacher at your side.



BUILD YOUR OWN TEST EQUIPMENT

As part of your home laboratory projects, you **BUILD** and **KEEP** a fine quality 5-inch **COLOR OSCILLOSCOPE** and a **Jewel Bearing VACUUM TUBE VOLTMETER**. You will find this equipment ideal for helping you earn in your spare time while a student—and later when working full time in the field.



BUILD AND KEEP A BIG 21-INCH TV SET

For added practical experience, you can also build and keep this quality 21-inch **TV SET** that provides TV reception at its finest (DeVry Tech also offers another home training without the TV set).



SEND FOR FREE BOOKLET!

"One of North America's Foremost Electronics Training Centers"



Accredited Member of
National Home
Study Council

DeVRY TECHNICAL INSTITUTE
CHICAGO 41, ILLINOIS



MAIL COUPON TODAY!

DeVRY TECHNICAL INSTITUTE

4141 Belmont Avenue, Chicago 41, Ill., Dept. SM-S-Q

Please give me your **FREE** booklet, "Electronics in Space Travel," and tell me how I may prepare to enter one or more branches of Electronics.

Name Age

Street Apt.

City Zone State

Canadian residents address: DeVry Tech of Canada, Ltd.,
2046 970 Lawrence Avenue West, Toronto, Ontario



AMAZING SCIENCE BUYS

for FUN, STUDY or PROFIT

BUILD YOUR OWN 4-1/4" REFLECTING TELESCOPE

(See Science & Mechanics Feb. '68—Page 123)

4 1/4" Mirror Telescope Kit—All the Optical parts you need to make an astronomical reflector telescope.

YOU GET:

1. A 4 1/4" dia. mirror, aluminized and over-coated with silicon monoxide. Precision ground and polished to 1/4 wave length. Focal length 45".
2. Aluminized diagonal mirror.
3. 2 PCX lenses to make a 1" focal length Ramsden eyepiece.
4. Directions for spacing, mounting, hints, etc.

No. 30,074-G.....\$16.25 Postpaid

Eyepiece mounts, finders, mirror mounts, mounted eyepieces and other parts also available. Write for Free Catalog "G"!

CARDBOARD TUBE:—4 1/4" I.D. x 46" long.

No. 80,038-G.....\$2.50 Postpaid

BRASS TURNING:—1 5/16" I.D. x 1 1/2" O.D. x 3" long.

No. 40,161-G.....\$.60 Postpaid

No. 118-G-1 1/4" I.D. x 1 5/16" O.D. x 2" long.

No. 40,162-G.....\$.40 Postpaid

TELESCOPE FINDER 7X:—

No. 50,080-G.....\$9.95 Postpaid

RING MOUNTS for above Finder.

No. 50,075-G.....\$3.95 Postpaid

See the Stars, Moon, Planets Close Up! 3" ASTRONOMICAL REFLECTING TELESCOPE

60 to 180 Power—Famous Mt. Palomar Type! An Unusual Buy! Assembled—Ready to use! You'll see the Rings of Saturn, the fascinating planet Mars, huge craters on the Moon, Star Clusters, Moons of Jupiter in detail. Galaxies! Equatorial mounts with lock on both axes. Aluminized and over-coated 3" diameter high-speed f/10 mirror. Telescope comes equipped with a 68X eyepiece and e mounted Barlow Lens, giving you 60 to 180 power. Low-cost accessory eyepieces available for higher powers. An Optical Finder Telescope, always so essential, is also included. Sturdy, hardwood, portable tripod. FRTES with Scope! Includes "HANDBOOK OF HEAVENS" plus "HOW TO USE YOUR TELESCOPE" BOOK.

Stock No. 85,050-G.....\$29.95 postpaid

KNOW THE TRUTH ABOUT POWER. Telescope experts will confirm that an Astronomical Telescope will only give you practical powers for to about 50 or 60 times per inch of objective diameter—powers above this only produce empty magnification—make viewing dim, difficult and unsatisfactory.

4 1/4" REFLECTING ASTRONOMICAL TELESCOPE!

With this scope you can see everything as above but with greater power plus will split finer stars. Mirror has twice the light gathering power. Mirror guaranteed to give theoretical limit of resolution. Furnace and pinhole focusing. Hardwood tripod, real equatorial mounting—only one adjustment follows stars! Aluminum tube, 6 power finder telescope, 2 standard also eyepieces and mounted Barlow lens give you powers of 40X, 90X, 120X, and 255X. Low-cost accessory eyepieces available for higher powers. FRTES with Scope! Includes "HANDBOOK OF HEAVENS" plus "HOW TO USE YOUR TELESCOPE" BOOK.

Stock No. 85,006-G.....\$74.50 F.O.B.

SPECTROSCOPE OPTICS KIT

All the optical parts necessary to make a working spectroscope for Science Fair projects or for your own experimentation. Consists of two Plano-convex lenses, one Double-convex lens, a 2" x 2" transmission replica grating slide with film replica and film slit and full instructions for setting up. Tubing and non-optical components are readily available in any home. Full directions included.

Stock No. 30,335-G.....\$2.00 Postpaid

BUILD A SOLAR ENERGY FURNACE

A fascinating new field. Build your own Solar Furnace for experimentation—many practical uses. Easy! Inexpensive! Use scrapwood! We furnish instructions. This is a powered furnace will generate temperatures from 2000° to 3000°. Uses metal. Sets paper ablaze in seconds. Use our Fresnel lens—14" diam. . . f.l. 14".

Stock No. 70,130-G.....Fresnel Lens.....\$6.00 Postpaid

INSTRUCTION BOOKLETS

	Stock No.	Price Postpd.
How to Build Projectors.....	901-A-G	30¢
Homebuilt Telescopes.....	9006-G	40¢
Photography with Your Telescope.....	9038-G	25¢
ALL ABOUT TELEPHOTO LENSES.....	9036-G	60¢
ULTRA CLOSE-UP Photography.....	9042-G	60¢
The Camera Lucida.....	9039-G	20¢
Infrared Light and its Uses.....	9040-G	75¢
Homemade Stereo-Adapters.....	9032-G	30¢
Homemade Stereo-Viewers.....	9034-G	30¢
"Building a Condenser Enlarger".....	9038-G	40¢
Time in Astronomy.....	9054-G	60¢
FUN WITH OPTICS.....	9050-G	60¢
HOW TO USE YOUR TELESCOPE.....	9055-G	60¢

(Includes directions on how to take photographs thru your telescope.)

Terrific Buy! American Made! OPAQUE PROJECTOR

Projects illustrations up to 3" x 3 1/2" and enlarges them. No film or negatives needed. Projects charts, diagrams, pictures, photos, lettering in full color or black-and-white. Operates on 115 volt, A.C. current, 6-ft. extension cord and plug included. Operates on 60 watt bulb, not included. Size 12" x 8" x 4 1/4" wide. Weight 1 lb., 2 oz. Plastic case with built-in handle.

Stock No. 70,199-G.....\$7.95 Postpaid

NEW BINOCULAR-TO-CAMERA HOLDER

For Existing Telescope Pictures

Bring distant objects 7 times nearer with a 35 mm. camera. 7x50 binoculars and our NEW BINOCULAR-TO-CAMERA HOLDER. Ideal for long-range shots of wild life, ships, plants, people, etc. Camera and binoculars attach easily. Use any binocular or monocular—any camera, still or movie. Take color or black and white. Full directions for taking telephotos.

Stock No. 70,223-G.....\$11.50 postpaid

ASTRO-COMPASS AND TRANSIT

War surplus! Astro Compass alone cost Govt. \$75. We have added a Sighting Level to improve versatility. Hundreds of uses in carpentry, brick laying, foundation work, grading, irrigation or drainage. Much below cost of ordinary surveying instruments. Ideal for do-it-yourselfers. 10 1/4" high, 6" long, 4" wide. Adjustable leveling platform. Sighting levels for aligning—also spirit level in sighting attachment. A tremendous bargain.

Stock No. 70,267-G.....\$19.95 postpaid

CLOSE OUT! MECHANICAL DRAWING SET

Regular Price \$18.00

Our Price Only \$8.00 Postpd.

American art. couldn't compete with foreign imports—thus you get a terrific bargain, even far below import prices. 10 handsome pieces in velvet-lined case. Nickel plated brass—precision American-made. We guarantee you'll be satisfied or money refunded.

Stock No. 50,200-G.....\$8.00 Postpaid

War Surplus American-Made 7x50 Binoculars

Big savings! Brand new! Crystal clear viewing power. Every optical element is coated. An excellent night glass—the size recommended for most life viewing. Life viewing. Exit pupil 7mm. Approx. field as 1,000 yds. in 376 ft. Carrying case included. American 7x50's normally cost \$16. Our war surplus price saves you real money.

Stock No. 1533-G.....only \$55.00 postpd. (Tax included)

BEGINNER'S LENS KITS! Fun for adults! Fun for children! Kits include plainly written, illustrated booklet showing how you can build lots of optical items.

Stock No. 2-G—Beginner's Kit, 10 Lenses.....\$ 1 postpd.
Stock No. 5-G—Gadgets & Devices, 45 Lenses.....\$ 5 postpd.
Stock No. 10-G—Experimenter's Dream, 60 Lenses.....\$10 postpd.

FREE CATALOG-G

128 Pages! Over 1000 Bargains!

Complete line of Astronomical Telescope parts and assembled Telescopes. Also huge selection of lenses, prisms, war surplus optical instruments, parts and accessories. Microscopes, binoculars, spectrometers, moth learning and teaching aids, etc.

EASY PAYMENT PLAN AVAILABLE! DETAILS WITH CATALOG!



ORDER BY STOCK NUMBER. SEND CHECK OR MONEY ORDER. SATISFACTION GUARANTEED!

EDMUND SCIENTIFIC CO., BARRINGTON, NEW JERSEY

START YOUR OWN BUSINESS!

ELECTRICAL APPLIANCE REPAIRING

SECURITY — INDEPENDENCE
WORK SHORT HOURS

EARN WHILE YOU LEARN!



Only had your course a few short weeks and have already made \$800.00. Going to quit my job paying \$250.00 straight salary to operate my own business.—J. D. S., St. Louis, Mo.

I work day times at the shipyard and after 4:00 P. M. I operate from my cellar and garage. I average \$10.00 to \$15.00 clear every day.—Walter Hanby, Brockton, Mass.



There are millions of electrical equipment units in daily use . . . in factories, homes, office buildings and on farms. Skilled electrical technicians are needed to keep this equipment in good running condition. Learn at home in spare time.

You can now BE TRAINED to fill this BIG NEED . . . a need that grows day by day because of new electrical inventions for home and factory.

If you are mechanically inclined, can hold and use tools, we can give you the training and time-saving kits that will enable you to . . . Command More Money at Work . . . A Better Paying Job Elsewhere . . . Or A Business Of Your Own!

The ELECTRONIC KIT, a multi-purpose trouble detector, and other valuable Shop Method Training is sent to you! All instruction material is written in simple, easy-to-understand language, chock full of hundreds of detailed photos and drawings. Used by servicemen the country over.

We show you how to quickly locate the trouble, how to fix it and what to charge. ALSO, how to solicit business and keep business coming to you.

Get Full Facts on how you can get this training at home in your spare time and pay for it out of your earnings while learning!

IN YOUR OWN KITCHEN, BASEMENT, OR GARAGE

You don't need elaborate fixtures or expensive equipment to be a successful repairman. Work as many hours as you wish. The Electrical Appliance Technician is his own boss!

\$5.00 - \$6.00 HOUR

often charged for making ordinary repairs. We show you how to repair refrigerators, vacuum cleaners, washing machines, motors, etc., etc.

AGE IS NO BARRIER

Nor is a minor physical handicap. Work is light, pleasant and PROFITABLE.

FREE BOOK

On America's fastest growing industry

SEND COUPON TODAY

WORKING KIT FURNISHED

CHRISTY TRADES SCHOOL, Dept. A-402
3214 W. Lawrence Ave., Chicago 25, Ill.

Gentlemen:
Please rush me your FREE ILLUSTRATED BOOK about Electrical Appliance Servicing, facts on your Electronic Kit and Special form for paying later from earnings while learning.

NAME _____ Age _____
ADDRESS _____
CITY _____ Zone _____ State _____

HE JUST DOESN'T HAVE IT..!



I MAILED THE I.C.S. COUPON. THE **FREE CAREER KIT** I.C.S. SENT ME BY RETURN MAIL PROVED TO ME WHAT I.C.S. COULD DO.



THE BOSS HEARD ABOUT MY I.C.S. COURSE. AFTER THREE MONTHS I GOT A GOOD RAISE—AND A LITTLE LATER...



I COULDN'T WAIT TO TELL THE FAMILY THE GOOD NEWS.



FREE! 1 2 3
I.C.S. CAREER KIT
 SEND COUPON NOW...
 GET ALL
 THREE BOOKLETS

"HOW TO SUCCEED"
 32-PAGE CAREER BOOKLET
 CAREER CATALOG...
 OPPORTUNITIES IN YOUR
 FIELD.
 SAMPLE LESSON (MATH)
 SHOWS I. C. S. METHOD.



For Real Job Security—Get an I. C. S. Diploma! I. C. S., Scranton 15, Penna.

Accredited Member,
 National Home Study Council

INTERNATIONAL CORRESPONDENCE SCHOOLS



BOX 71025G, SCRANTON 15, PENNA.

In Hawaii reply P. O. Box 418, Honolulu

(Partial list of courses)

Without cost or obligation, send me "HOW TO SUCCEED" and the opportunity booklet about the field BEFORE which I have marked X (plus sample lesson):

ARCHITECTURE AND BUILDING CONSTRUCTION

- ☐ Air Conditioning
- ☐ Architecture
- ☐ Arch. Drawing and Designing
- ☐ Building Contractor
- ☐ Building Estimator
- ☐ Carpenter Builder
- ☐ Carpentry and Millwork
- ☐ Carpenter Foreman
- ☐ Heating
- ☐ Painting Contractor
- ☐ Plumbing
- ☐ Reading Arch. Blueprints

ART

- ☐ Commercial Art
- ☐ Magazine Illustration
- ☐ Show Card and Sign Lettering
- ☐ Sketching and Painting

AUTOMOTIVE

- ☐ Automobile
- ☐ Auto Body Rebuilding and Refinishing
- ☐ Auto Engine Tuneup
- ☐ Auto Technician

AVIATION

- ☐ Aero-Engineering Technology
- ☐ Aircraft & Engine Mechanic
- ☐ BUSINESS
- ☐ Accounting
- ☐ Business Administration
- ☐ Business Management
- ☐ Cost Accounting
- ☐ Creative Salesmanship
- ☐ Managing a Small Business
- ☐ Salesmanship
- ☐ Professional Secretary
- ☐ Public Accounting
- ☐ Purchasing Agent
- ☐ Salesmanship and Management
- ☐ Traffic Management

CHEMICAL

- ☐ Analytical Chemistry
- ☐ Chemical Engineering
- ☐ Chem. Lab. Technician
- ☐ Elements of Nuclear Energy
- ☐ General Chemistry
- ☐ Natural Gas Prod. and Trans.
- ☐ Petroleum Prod. and Engr.
- ☐ Professional Engineer (Chem)
- ☐ Pulp and Paper Making

CIVIL ENGINEERING

- ☐ Civil Engineering
- ☐ Construction Engineering
- ☐ Highway Engineering
- ☐ Professional Engineer (Civil)
- ☐ Reading Struc. Blueprints
- ☐ Sanitary Engineer
- ☐ Structural Engineering
- ☐ Surveying and Mapping

DRAFTING

- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Drafting & Machine Design
- ☐ Electrical Drafting
- ☐ Mechanical Drafting
- ☐ Sheet Metal Drafting
- ☐ Structural Drafting

ELECTRICAL

- ☐ Electrical Engineering
- ☐ Elec. Engr. Technician
- ☐ Elec. Light and Power
- ☐ Practical Electrician
- ☐ Mechanical Lineman
- ☐ Professional Engineer (Elec)

HIGH SCHOOL

- ☐ High School Diploma

- ☐ Good English
- ☐ High School Mathematics
- ☐ High School Science
- ☐ Short Story Writing
- ☐ LEADERSHIP
- ☐ Industrial Foremanship
- ☐ Industrial Supervision
- ☐ Personnel-Labor Relations
- ☐ Supervision

MECHANICAL AND SHOP

- ☐ Diesel Engines
- ☐ Gas-Elec. Welding
- ☐ Industrial Engineering
- ☐ Industrial Instrumentation
- ☐ Industrial Machinery
- ☐ Industrial Safety
- ☐ Machine Shop Practice
- ☐ Mechanical Engineering
- ☐ Professional Engineer (Mech)
- ☐ Quality Control
- ☐ Reading Shop Blueprints
- ☐ Refrigeration and Air Conditioning
- ☐ Tool Design
- ☐ Tool Making

RADIO, TELEVISION

- ☐ General Electronics Tech.

- ☐ Industrial Electronics
- ☐ Practical Radio-TV Eng'g
- ☐ Practical Telephony
- ☐ Radio-TV Servicing

RAILROAD

- ☐ Car Inspector and Air Brake
- ☐ Diesel Electrician
- ☐ Diesel Eng. and Fireman
- ☐ Diesel Locomotive

STEAM and DIESEL POWER

- ☐ Combustion Engineering
- ☐ Power Plant Engineer
- ☐ Salford Class Eng.
- ☐ Stationary Fireman

TEXTILE

- ☐ Carding and Spinning
- ☐ Cotton Manufacture
- ☐ Cotton Winding and Weaving
- ☐ Loom Fixing Technician
- ☐ Textile Designing
- ☐ Textile Finishing & Dyeing
- ☐ Throwing
- ☐ Winding and Weaving
- ☐ Wursted Manufacturing

Name _____ Age _____ Home Address _____
 City _____ Zone _____ State _____ Working Hours _____ A.M. to P.M. _____
 Occupation _____

Canadian residents send coupon to International Correspondence Schools, Canadian, Ltd., Montreal, Canada. . . . Special low monthly tuition rates to members of the U. S. Armed Forces.



YOU
can
acquire

LAW AT HOME! EARN LL. B. DEGREE

LaSalle's famous Law Library—used as reference in many Law libraries and Law offices—has enabled thousands to master Law surprisingly fast, in spare hours at home, for business and professional advancement.

These 14 remarkable volumes, compiled by leading professors and lawyers, cover the whole basic field of Law in condensed, orderly, simplified manner.

You advance rapidly with this great library, plus special lectures furnished. We guide you step-by-step with personalized Problem Method of instruction... you learn by doing—handling legal problems—not by memorizing rules.

Send for two FREE booklets, "Law Training for Leadership," and "Evidence," answering questions about Law and its value to you. Mail coupon below. No obligation.

Accredited member, National Home Study Council

LA SALLE EXTENSION UNIVERSITY A Correspondence Institution

417 S. Dearborn St. Dept. 860L Chicago 5, Ill.

Send me your two FREE booklets described above, without obligation.

Name.....Age.....

Street.....

City, Zone & State.....

INVESTIGATE ACCIDENTS

Train quickly in your own home for repeat income in the exciting, secure Claim Investigation and Claim Adjusting field. Our students and graduates are already earning \$4, \$5, \$6 an hour extra SPARE TIME—and up to \$10,000 a year Full Time. You need NO prior experience or higher education. Your age does NOT matter.

HERE IS YOUR CHANCE FOR ACTION AND REAL JOB SECURITY

As a trained Claim Investigator you will (1) INVESTIGATE FACTS and (2) DISTRIBUTE MONEY as the representative of wealthy organizations.

No other business offers you greater opportunities for success and security. Here's why: The huge, rapidly expanding Claim Investigation and Adjusting Profession right now distributes more money than any other service industry. And it's growing fast. Over 200 MILLION ACCIDENTS must be investigated this year for Insurance Companies, Airlines, Railroads, Steamship Lines, and Government Offices.

MAIL NOW FOR FREE BOOK ➔

SEND TODAY for Big, FREE, Illustrated Catalog. Learn the exciting facts about Universal Schools' low cost training. No obligation. No salesman will call. GI APPROVED.

EARN \$125 A WEEK AND UP

BE AN AUTO-DIESEL EXPERT—LEARN A TRADE YOU LIKE

You learn fast in our shops because you learn with tools on real equipment. Students short of money may earn most of their expenses by doing part-time work. Experienced instructors explain WHY and show you HOW, then you DO IT YOURSELF. Forty years' experience training men. Successful graduates in 50 states and many foreign countries. Many of our graduates earn \$125 a week and up. Approved for veterans. Day and evening classes. Free bulletin—write today.

NASHVILLE AUTO-DIESEL COLLEGE
226 7th Ave., No., Dept. 44, Nashville, Tenn.

SCIENCE ENGINEERING

Bachelor's Degree in 27 or 36 Months

Accelerated year-round program: Aeronautical, Chemical, Civil, Electrical, Mechanical, Metallurgical, Mathematical, Chemistry, Physics. Modest rate. Earn board. New classes start Sept., Jan., March, June. Catalog: 1380 E. Washington Blvd., Fort Wayne 2, Indiana.

INDIANA TECHNICAL COLLEGE

8" POWER SAW NOW ONLY \$9.95

Blade tilts — table stays level. All iron and steel construction. Single hand-wheel control. Blade raises and lowers. Sold direct from factory at unusual saving. Money back guarantee. Send for FREE fully illustrated booklet.

AMERICAN MACHINE & TOOL CO. ROYERSFORDS, PA.



UNIVERSAL SCHOOLS

6801 Hillcrest Ave.
Dept. SX8, Dallas 5, Texas

Please rush me your FREE book on Claim Investigation. This does not obligate me and no salesman will call.

Name.....Age.....

Address.....

City.....Zone.....State.....

Approved by Government for Korean Veterans

Make More Money in One of Today's FASTEST-GROWING Industries

We'll train and establish you in YOUR OWN LIFETIME BUSINESS



U. S. Dept. of Commerce says:
45 million homes in U. S. with

\$750 million yearly potential
in rug and upholstery cleaning.

In your town, 2 jobs a day
earns \$6,750 profit first year.

You gain financial success as
an independent businessman.

START PART-TIME...IF NOW EMPLOYED



Get in on the ground floor of the booming furnishings-cleaning field... a \$750,000,000 industry says the Dept. of Commerce. Record population growth and home construction have created great demand for these services. If you qualify for a dealership in your town, you'll be trained by an established dealer and at a training school. Start part-time if employed and as you expand operation, switch to full-time. Business quickly established. Alert dealers gross \$9.00 hourly. All service rendered on location. No shop needed. If needed, we help finance you. We furnish everything to get you started.

5 WAYS TO MAKE MONEY

You offer five vital services, thereby multiplying profits on most jobs:

1. **Duraclean:** Absorption process safely cleans carpets, upholstery. No scrubbing, soaking, shrinkage. Aerated foam gently loosens soil and absorbs it like a blotter. Furnishings dry quickly for use same day.
2. **Soil Retarding:** Keeps furnishings clean longer. Applied after cleaning, invisible film protects fibers from dirt.
3. **Mothproofing:** Backed by International 6-Year Warranty.
4. **Flameproofing:** Theatres, hotels, institutions offer huge potential. Treatment retards fires from flaming up.
5. **Spotting:** You remove stubborn spots, stains expertly with special chemicals.

We Help You Grow

YOUR personal success is of the utmost importance to Headquarters, for as you grow so grows the Duraclean Dealer organization. Thus, your initial training is only the beginning of a continuous assistance program designed to build your business. When you write, phone or visit Hdqrs., you receive prompt, expert counsel from a staff of specialists. We work with you 12 months of the year. Among the 25 regular services you receive include conventions, regional conferences, new product development, trademark protection, sales letters, sales books, a complete advertising kit, a monthly sales-building magazine plus others. Our whole program is cooperative. Our unique Mutual Cooperation System and customer satisfaction have built this 29-year-old world-wide organization.

What Dealers Say

W. Lookiebill (St. Louis): My 27th year! Began during depression and built business on good service.



D. Chiles (N. Platte): Duraclean say gross \$9.00 per hour. I gross up to \$12.00. Many dealers do much better.



M. Lyons (Chgo): 2nd year should hit \$100,000; 1st was \$40,000. Hdqrs help makes it possible.



E. Roddey (Hampton, Va.): Did \$600.00 first 12 days in January. My business keeps growing each month.



A. Wilson (Tulsa): Made \$1,299 this month working alone. Duraclean outperforms all competitors.



"... (Duraclean) standards in keeping with service to which... carpets and consumer are entitled." —Avisco (American Viscose Corp)

"... superior to any on-location process with which I'm familiar." —President, Modern Tufting Co.

"... we approve this process... in keeping with better service to Mrs. Housewife." —Aldon Rug Mills



Nationally Advertised

You are backed by a national advertising program which is larger than all other similar programs in the industry combined!

Consumer Advertising: Ads dramatizing your unique services reach millions of homeowners through leading magazines as Parents', House & Garden, Canadian Homes & Gardens plus many more.

Trade Advertising: More and more retailers are turning over customers to Duraclean Dealers for servicing. Key trade journals are used to target local furniture stores, dept. stores, dry cleaners, decorators, etc., to become your agents.

To coordinate both trade and consumer campaigns in your town, we provide you with tie-in promotional materials such as ad reprints, display cards, direct mail pieces, ad mats and others.

Backed by Famous Awards



These two important honors conferred on Duraclean give proof of your superior services. As a Duraclean Dealer, you will be the only clean-



ing service in town backed by both these famous seals. No wonder customers buy Duraclean so quickly!

What Manufacturers Say

"... (Duraclean) standards in keeping with service to which... carpets and consumer are entitled." —Avisco (American Viscose Corp)

"... superior to any on-location process with which I'm familiar." —President, Modern Tufting Co.

"... we approve this process... in keeping with better service to Mrs. Housewife." —Aldon Rug Mills

"... we approve this process... in keeping with better service to Mrs. Housewife." —Aldon Rug Mills

Mail Coupon — You Get Free Booklets!

"OWN A BUSINESS" COUPON

DURACLEAN CO., 0-368 Duraclean Bldg., Deerfield, Ill.

WITHOUT OBLIGATION, show me how I may enjoy a steadily increasing life income in my OWN business. Enclose FREE booklets and free details.

Name

Address

City State

DURACLEAN® CO.,

0-368 DURACLEAN BLDG.
DEERFIELD, ILLINOIS

Enjoy the Rich Rewards



YOU TRAIN AT HOME FOR A WELL-PAID JOB OR A BUSINESS OF YOUR OWN

Millions of Americans are "living like kings." You see the signs of prosperity everywhere—fine cars, new homes and color television sets. You wonder why success has passed you by. The answer may well be *lack of training*. Industry offers rich rewards to technical men: Excellent jobs, high pay and security. This is especially so in the air conditioning and refrigeration field. *The industry needs trained men—desperately*. CTI is helping fill that need. Interested in your future? If so, *mail coupon on next page for free facts*. Discover how you can get ready for success—at home in spare time.

LOOK! You Learn Fast Because You Practice with Real Equipment!

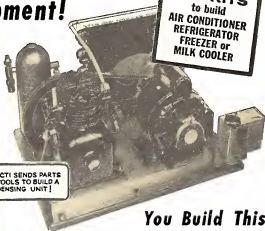
You learn by practicing because CTI sends you 25 training kits. You get real experience, too, because you work on 23 "on-the-job" programs. And you do 10 service and trouble-shooting jobs! It's almost like working out in the field with an instructor at your side. Remember, you build an air conditioner, refrigerator, freezer or milk cooler. All parts and tools are yours to use and keep. Commercial Trades Institute was first with this wonderful training method—and nothing like it is available elsewhere.



CTI STUDENTS ARE MAKING GOOD

"I have been very busy. Had an offer to work for an appliance dealer but it looks like I'll be in business for myself before long."—*Frank Fuller, Wells, N. Y.*... "Am now working in the field. Earn \$40 more per month than before."—*Frank Krotzer, Houston, Tex.*... "I not only got a job, but today am foreman, earning \$60 a week more than before I enrolled."—*E. E. Hughes, Chicago*... "Have my own business. Only problem is: Too much business!"—*Conrad King, Cynthia, Ky.* You can do as well!

**25
BIG KITS**
to build
AIR CONDITIONER
REFRIGERATOR
FREEZER or
MILK COOLER



You Build This Heavy-Duty Refrigeration Unit

You get all parts and tools to build a heavy-duty, commercial-type $\frac{1}{4}$ h.p. refrigeration high-side (illustrated above). At left are photos of two other kits. One shows special service tools. The other depicts a motor, fan, pulley, more tools. Kits are sent on a planned schedule to help you progress in easy stages. You develop skill, get experience, and learn faster through this Shop-Method training plan.

MAIL TODAY FOR FREE BOOKLET

that Await Skilled Men

20,000 New Mechanics Are Needed Yearly in

AIR CONDITIONING AND REFRIGERATION

You'll like the air conditioning and refrigeration field! It is one of America's oldest industries—yet *growing like an infant*. Each year, some 3 million refrigerators, 1 million freezers and 2 million air conditioners are sold. Not only homes, but stores, offices, restaurants, factories, motels and transport systems use some form of refrigeration. No wonder that trained men are in big demand... 20,000 new mechanics must be added to the ranks each year. It's an *uncrowded field*—there's plenty of "elbow room" to grow. Not just big money, but *security*, can be yours! Let CTI train you for a better future. *Mail coupon for free facts.*



WANT TO OPEN A SHOP AND BE THE BOSS?



As soon as you're trained, you can fill a good job and get well paid for your skill. But if you're an independent fellow, who likes to give (not take) orders, the refrigeration field is your dish. Many CTI graduates have started in business. Some have become dealers, and they profit not only from service work, but from sales. You'll not lack opportunity in this field.

It's Easy to Make Money as You Train

Most CTI students do part time work for profit soon after enrolling. Some get jobs with local dealers. Many prefer to make calls on their own. A number have made service arrangements, for a fee, with meat markets, motels, etc. With their earnings, students pay their tuition, buy shop equipment, and often have enough left to put in the bank. It's not unusual for students to make more money on part time refrigeration work than on their regular jobs.

BIG OPPORTUNITY IN AUTO AIR CONDITIONING

It is estimated that nearly 500,000 new cars will have air conditioners this year. Dealers are advertising for skilled refrigeration mechanics. It's an interesting field that's packed with profit possibilities. Once skilled, it should not be difficult to start your own installation and repair shop.



This is the home of CTI, one of the world's great home study schools. CTI offers "training you can trust." Over 40,000 graduates.

COMMERCIAL TRADES INSTITUTE
1400 Greenleaf Avenue • Chicago 26, Illinois

AND SAMPLE LESSON

GET THE FACTS NOW—DECIDE LATER

The air conditioning and refrigeration industry is huge and uncrowded. It offers tens of thousands of top pay jobs... as well as exceptional opportunities to go in business. But you don't have to make up your mind right now about making the "big change." First get the facts. Study them. Then decide. You can have the facts—free—by filling out and mailing coupon. Act today!

COMMERCIAL TRADES INSTITUTE

1400 GREENLEAF AVENUE
CHICAGO 26, ILLINOIS

DEPT. R-741

Tell me how I can qualify for a better job or a business of my own. Send booklet, *Success in Air Conditioning & Refrigeration*, and Lesson Sample, both FREE.

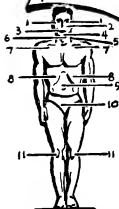
Name _____ Age _____

Address _____

City _____ Zone _____ State _____



FEAR NO MAN! Learn KARATE* Self-Defense!!!



Learn Pressure and Nerve Centers From Special Charts

Faster, More Effective than JUDO!

(*pronounced KA-ROT-A)

Now you can learn Karate,* the most deadly and effective method of self-defense hand-to-hand combat ever devised by the ancient Japanese masters. The centuries old method of Karate teaches you how to use the **PRESSURE POINTS AND NERVOUS SYSTEM** of your opponent's body to **RENDER HIM ABSOLUTELY HELPLESS WITHIN SECONDS**. Your hands, fingers, elbows and feet actually become super weapons when using the amazing **KARATE TECHNIQUE** which was originally and secretly reserved for the Emperor's hand-picked guards. In studying Karate, you will immediately understand how a 97-pound weakling can easily overpower and even cripple a 200 pound brute in just seconds, using only your bare hands. Strangely enough, Karate is easier to learn and use than judo, because it does not employ the intricate movements and throws which can take years of practice to master. In this new and heavily illustrated book,* "Karate, the Open Hand and Foot Fighting," Mr. Bruce Tegner, one of the world's great Karate instructors, explains, shows, teaches and simplifies the fascinating art of Karate for you. In this wonderful new book, Mr. Tegner has included many anatomical charts showing how to use the nervous system and pressure points for mild, serious, and fatal blows. You will learn the Karate striking points and positions, defense against annoying attacks and serious attacks. **YOU WILL SEE BRUCE TEGNER IN ACTION IN OVER 150 PHOTOGRAPHS TEACHING YOU HOW TO HANDLE MUGGERS, STREET-FIGHTERS AND EVEN KNIFE AND GUN ATTACKS.** In studying Karate, you will understand why even high ranking judo experts will avoid combat with a good Karate man. Mail the coupon below right now, and you may examine this fabulous book for 7 full days at our risk. You must be completely satisfied, gain more

confidence in yourself and your physical ability, or return the book to us for a full refund. We make this amazing offer because we are confident that the knowledge of Karate contained in this book will help you become the confident person you want to be. **ORDER NOW!**

DAVIS & BENNETT

Dept. SM-8

31 West 47th Street

New York 36, N. Y.

Gentlemen:

Please rush my copy of Bruce Tegner's "Karate the Open Hand and Foot Fighting" in a plain wrapper immediately. I enclose full payment of \$2.98 and there will be nothing to pay on delivery. If for any reason I am not satisfied, I may return the book in 7 days for a full refund.

NAME

ADDRESS

CITYZONE.....STATE.....

☐ I am over 18 years of age. ☐ I am under 18, but have parent/guardian permission to study Karate. ☐ Send C.O.D.

* Library of Congress catalog
cord No. 59-12896.

DON'T BE HALF-TRAINED...

Be A MASTER TECHNICIAN In One Of AMERICA'S BIG 3 INDUSTRIES



MAKE MORE MONEY

A Successful Career... Security...
Are Yours NOW in Modern Industry!

RIGHT NOW IS THE BEST TIME for you to get into the field of your choice! You can be a part of its growth, you can increase your earning power, you can really build a Successful, Secure Future. Send coupon for complete facts by mail...NO SALESMAN WILL CALL!!!

N.T.S. TRAINS YOU RIGHT, FAST and EASY! Incomplete "short-cut" training limits your earning power, disqualifies you for top-pay jobs. N.T.S. Shop-Tended Home Training is...

- * **BETTER**—classroom developed, lab and shop-tested, industry-approved, home study designed.
 - * **MORE COMPLETE**—you learn ALL Phases and you receive Everything You Need for Success...
 - * **LOWER COST**—One Master Course at One Low Tuition gives you more training at lower cost.
- TRAINING PAYS FOR ITSELF AND MORE... Earn your tuition...and more...while in training. We'll show you how. Many students have...so can you!

TELEVISION RADIO-ELECTRONICS



Includes...
RADIO SET
TV SET
MULTITESTER

Business of Your Own or High-Pay Career In...
Service & Repair
Broadcasting & Communications
Hi-Fi & Stereo Sound Systems
Electronics for Guided Missiles
TV Radio Manufacturing
Industrial Electronics
Automation & Computers
Radar & Micro Waves
TV-Radio Sales
FCC License Preparation

AUTO MECHANICS & DIESEL



Includes...
TOOLS
SOCKET SET
ANALYZERS

Business of Your Own or High-Pay Career In...
Service & Maintenance
Motor Tune-Up
Automatic Transmissions
Diesel & Fuel Injection
Overhauling & Rebuilding
Automobile Air Conditioning
Electrical Systems
Automatic Power Devices
Industrial & Marine Engines
Foreign Car Sales & Service

AIR CONDITIONING REFRIGERATION ELECTRICAL APPLIANCES



Includes...
TOOLS
GAUGES
TESTER

Business of Your Own or High-Pay Career In...
Air Conditioning-Refrigeration
Domestic & Commercial
Industrial & Mobile
Installation & Contracting
Automobile Air Conditioning
Electrical Appliances
Small & Major
Heating, Water & Combustion
Sewer, Service & Repair
Manufacturing & Distribution

RESIDENT TRAINING AT LOS ANGELES
If you wish to take your training in our
Resident School in Los Angeles, send
NOW in our big, modern Shops and
Labs. Here you work with latest equip-
ment. Final and most complete train-
ing offered by any school. Expert,
friendly instructors. Personal attention.
Help in finding home near school...
and part time job while you learn.
Check box in coupon for full information.

MEMBER
NATIONAL TECHNICAL SCHOOLS
World-Wide Training Since 1905
4000 S. Figueroa Street
Los Angeles 37, Calif., U.S.A.

GET THE BENEFIT OF OUR OVER 50 YEARS EXPERIENCE

CHOOSE YOUR FIELD. SELECT ONE OF THE "BIG 3" NOW. CHECK COURSE DESIRED

Mail One of These
2 Coupons TODAY
for

**FREE
BOOK**
and
ACTUAL LESSON

Ask a Friend
to Send the Other.
It's Fun to
Study Together!

NO OBLIGATION...
NO INCONVENIENCE...
NO SALESMAN WILL
CALL ON YOU!!!

NATIONAL TECHNICAL SCHOOLS

WORLD-WIDE TRAINING SINCE 1905

National Technical Schools, Dept. P-70
4000 S. Figueroa St., Los Angeles 37, Calif.

Please rush FREE Book and Actual Lesson checked
below. No obligation. No salesman will call.

- ☐ TV-Radio-Electronics Book
☐ Auto-Mechanics & Diesel Book
☐ Air Conditioning, Refrigeration
& Electrical Appliance Book

CHECK
ONE

CHECK
ONE

Name _____ Age _____

Address _____

City _____ Zone _____ State _____

☐ Check here if interested ONLY in Resident Training at L.A.

VETERANS: Give date of discharge _____

NATIONAL TECHNICAL SCHOOLS

WORLD-WIDE TRAINING SINCE 1905

National Technical Schools, Dept. P-70
4000 S. Figueroa St., Los Angeles 37, Calif.

Please rush FREE Book and Actual Lesson checked
below. No obligation. No salesman will call.

- ☐ TV-Radio-Electronics Book
☐ Auto-Mechanics & Diesel Book
☐ Air Conditioning, Refrigeration
& Electrical Appliance Book

CHECK
ONE

CHECK
ONE

Name _____ Age _____

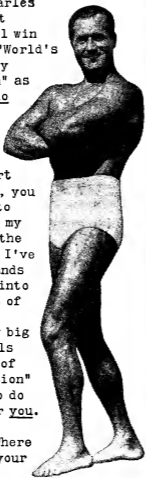
Address _____

City _____ Zone _____ State _____

☐ Check here if interested ONLY in Resident Training at L.A.

VETERANS: Give date of discharge _____

My name is Charles Atlas. I can't promise you'll win the title of "World's Most Perfectly Developed Man" as I did. But I do believe I can make a powerful He-Man out of you-- in a very short time. In fact, you can prove it to yourself-- at my risk. During the last 30 years I've turned thousands of weaklings into human dynamos of strength and endurance. My big free book tells how my secret of "Dynamic Tension" may be able to do such a job for you. No cost or obligation. Where shall I send your copy?



FREE BOOK



Mail coupon now for FREE 32-page book. Tells how I can give you "Stand-Out" muscles--how "Dynamic Tension" can make you a new man--confident, popular, successful. See actual photos of men who became "Atlas Champions." Read answers to vital questions about your health, your personality, your future. Rush coupon to me personally:

CHARLES ATLAS, Dept. 488, 115 E. 23 St., N. Y. 10, N. Y.

CHARLES ATLAS, Dept. 488

115 East 23rd St., N. Y. 10, N. Y.

In England: Chitty St., London W.1

Dear Charles Atlas--Here's the Kind of Body I Want:

(Check as many as you like)

- | | |
|---|---|
| <input type="checkbox"/> Slimmer Waist, Hips | <input type="checkbox"/> More Powerful Arms, Grip |
| <input type="checkbox"/> Broader Chest, Shoulders | <input type="checkbox"/> More Powerful Legs |
| <input type="checkbox"/> More Weight, Solid | <input type="checkbox"/> Better Energy, Sleep |

Send me, absolutely FREE, a copy of your famous book showing how "Dynamic Tension" can make me a new man. 32 pages, crammed with photographs, answers to vital questions, and valuable advice. No obligation.

Name.....Age.....

(Please Print or Write Plainly)

Address.....

City.....Zone.....State.....



"A week ago I could hardly draw a straight line!"

QUALIFY FOR A BETTER JOB WITH NEW SPACE-AGE INDUSTRIAL DRAWING SYSTEM

Amazing new and faster method of 3-dimensional mechanical sketching-- for men ambitious to qualify for more important positions in modern industry. Helps you to get a job, hold it against competition, advance quickly to positions of greater responsibility at higher pay. Ability to "talk with a pencil" is tremendously valuable to production workers, factory service men, office personnel, and practically everyone in industry today. It's vitally necessary for all building tradesmen. Even helpful to sales people in such fields as house furnishing, interior decorating, and others where ability to make a quick sketch often clinches an order. Sketch-Easy method used in U. S. Armed Forces and many large industries for up-grading personnel. Not a long-drawn-out drafting course, but a quick short-cut to accurate 3-dimensional sketching--so easy you can start sketching in on your skill in a week.

No art ability needed. Write TODAY for complete FREE details.

ASSOCIATED AERO SCIENCE LABORATORIES, INC.
(Training Service Division), 250 S. Prairie Ave., Hawthorne, Calif.
Department B-8

HOW TO PROTECT YOUR INCOME! Earn Extra Money With A Rapid

SHEAR SHARPENER AND KNIFE SERRATOR



Easy to operate--professional-type sharpener does a perfect job in just 2 minutes on all types scissors and shears, including plinking shears. Knife guide puts proper edge on any blade. Knife serrating attachment puts saw-tooth edge on hand or foot steel blades. Quick profits from homes, dressmakers, barbers, restaurants, hotels, butchers, etc. No experience needed. Big opportunities with this precision blade bearing machine. Has 3/4 h.p. motor. A money-making investment--write for FREE FOLDER S-M-17.
BEAVER MFG. CO. P.O. Box 434, 800 So. Isis Ave., Inglewood, Calif.



FINISH HIGH SCHOOL AT HOME!

Vocational or College Prep.

No classes to attend. Easy spare-time training at home covers big choice of subjects. Many complete high school in two years. Friendly instructors; standard texts. Full credit for previous schooling. Diploma awarded. If you have left school and are 17 or over, write for FREE catalog!

Accredited Member, National Home Study Council

Wayne School of LaSalle Extension University

A Correspondence Institution

419 So. Dearborn, Dept. 865W, Chicago 5, Ill.

Start Your Own Money-Making Business

Clean rugs on customers' floors--upholstery in their homes--even painted walls--with highly efficient electric machines which are making big money for others and giving them independence. Write today for complete information. 10¢ PRICE!
VON SCHRADER MFG. CO., Dept. 813 "R" Pl., Racine, Wis.

PROFIT IN YOUR SPARE TIME

FIX SMALL GASOLINE ENGINES

Outboard • Powermower • Chain Saw • Tractor

MAKE EXTRA MONEY--or, repair

your engines and SAVE. Illustrated, easy-to-understand, Home Study Course. FREE information. Write TODAY!

LINCOLN TECHNICAL INSTITUTE

Suite 8-P, 472 Market Street, Newark 5, New Jersey

REPAIR HYDRAULIC JACKS

EARN HIGH WAGES in this noncompetitive field. Work in your own basement or garage. Follow simple instructions in our illustrated repair manual. Details free. Write for
HYDRAULIC PARTS SUPPLY, Box 4104, Dept. SM, El Paso, Tex.



You'll Call This Famous Manual YOUR MIRACLE CAR FIXER!



Whether You're a Beginner or Expert, It will Show
You How to FIX ALMOST ANY PART OF ANY CAR
Quickly, Easily, Right the First Time!

WOULDN'T it be great if you could look over any make car — spot immediately even the most complicated trouble — and then fix it in a jiffy? Sure it would — and now YOU can do this very thing!

Yes, you can fix practically any part of any car listed here — when you use MOTOR'S New Auto Repair Manual, the "Miracle Car Fixer." Right at your fingertips, it puts the "meat" from hundreds of Official Factory Manuals and service bulletins — boiled down into simple, understandable me-to-you language. It's as if the men who actually make the cars were standing right beside you — explaining how to do the job quickly, easily, and right the first time!

As Simple as A-B-C!

First, turn to the giant Troubleshooter Section. It rapidly pinpoints any one of 2,300 car troubles — tells you the exact repair needed. There's no guesswork! Then you turn to the Repair Section and fix the trouble. It's simple as that — because MOTOR'S clear step-by-step instructions and large photos and diagrams make everything so easy you CAN'T go wrong! It turns beginner mechanics into experts; shows experts how to save time, work and money!



H. D. Hartman

Ask the men who run service stations. They'll tell you. E. A. Kneer, of Merrick, N. Y. writes: "In our shop we consider MOTOR as our Bible. It's pulled us out of many a rough spot." And H. D. Hartman of Baltimore says: "MOTOR has saved us a lot of time and money. We cannot do without it."



E. A. Kneer

Here's What You Get

Over 1,000 double-size pages. Over 2,300 close-up photos of actual repair procedures. 30,000 specifications. 225,000 repair facts. 158 Quick Check charts. Giant TROUBLE-SHOOTER Section. Foreign Car tune-up data. Much More!

USE IT FOR A FULL WEEK — FREE

Your credit is O.K. with us, so we'll send you a copy of the new MOTOR for a FREE 7-day examination. Look it over. Use it. If it doesn't pay for itself on the very first job return it and forget the matter. You don't risk a penny. So rush the coupon TODAY to: MOTOR Book Dept., Desk O-18, 250 W. 55th St., New York 19, N. Y. (Schools, Bookstores: write for discounts.)

Same FREE 7-Day Trial on 1960 TRUCK REPAIR MANUAL



Covers every job on every popular make truck made since 1952 including GM, Mack and Cummins Diesels. Engines, fuel systems, ignition systems, starters, generators, transmissions, axles, brakes, steering, etc., etc.



**MOTOR'S
AUTO
REPAIR
MANUAL**

OVER 3 MILLION
COPIES SOLD
*
USED BY
U.S. ARMED FORCES

Covers ALL THESE CARS 1953-1960

Buick	Dart	Hudson-'55-'57	Oldsmobile
Cadillac	De Soto	Imperial	Plymouth
Chevrolet	Dodge	Jewett	Pontiac
Chrysler	Edsel	Lincoln	Rambler
Continental	Falcon	Mercury	Studebaker
Corvair	Ford	Nash-'55-'57	Thunderbird
			Volkswagen

FIX ANY PART

Ignition	Fuel Pumps	Differentials
Generator	Engines	Brakes
Generator	Automatic	Steering
Regulators	Transmissions	Dash Gauges
Starting Motors	Overdrive	Starter
Carburetors	Suspensions	Switches

FREE 7-DAY TRIAL
Return and pay nothing
if not satisfied

MAIL COUPON NOW FOR 7-DAY FREE TRIAL (Attach to postcard for faster action)

MOTOR BOOK DEPT.
Desk O-18, 250 W. 55th St., N.Y. 19, N.Y.
Rush to me at once (check box opposite book you want)

☐ **MOTOR'S New AUTO REPAIR MANUAL**
If O.K., I will remit \$2 in 7 days, \$3 monthly for 2 months and a final payment of \$1.50 (plus 48¢ delivery charges) one month later. (Otherwise I will return the book postpaid in 7 days. (Foreign price, remit \$10 back with order.)

☐ **MOTOR'S New TRUCK REPAIR MANUAL**
If O.K., I will remit \$3 in 7 days and \$5 monthly for 3 months, plus 48¢ delivery charges, with final payment. (Otherwise I will return book postpaid in 7 days. (Foreign price, remit \$11 back with order.)

☐ Check box and have 48¢ shipping charge by enclosing WITH coupon in envelope addressed: perment of \$1.50 for Auto Repair Manual (or \$6 for Truck Repair Manual) plus sales tax. Same 7-day return refund privilege applies.

Print Name.....Age.....

Address.....

City.....Zone.....

State.....



I'd like to give this to my fellow men... while I am still able to help!

I am younger once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my Winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things; of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish*! And anyone who tries to tell you that you can *think* your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned*! I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life, is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept

something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows". It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own". It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turn-

ing out a product that has a steady and ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

VICTOR B. MASON

1512 Jarvis Ave., Suite M-5-J
CHICAGO 26, ILLINOIS

Fill the Gaps in your Family's Education with the amazing **MADE SIMPLE** **SELF-TEACHING Encyclopedia**

Your First MADE SIMPLE SELF-TEACHING Encyclopedia Volume—Now Ready! **MATHEMATICS MADE SIMPLE!**

Simple everyday mistakes in arithmetic, algebra, geometry and trigonometry can cost you time, money, job promotions and good school grades.

This handsome, expertly-prepared book covers: short cuts to add, subtract, multiply, divide whole numbers, fractions, decimals, algebraic expressions, signed numbers; read and interchange fractions, decimals, percents; find the area of a plot of land, room, etc.; ratio, proportion, algebraic equations; definitions of mathematical expressions; how logarithms simplify multiplication, division; how slide rule makes figuring fast, easy, accurate, exponents, theorems; constructing geometric figures for everyday problems; solid geometry, trigonometry to measure large or distant objects; angle functions for practical problems; representing quantities and sizes on graphs and scales—and much more.

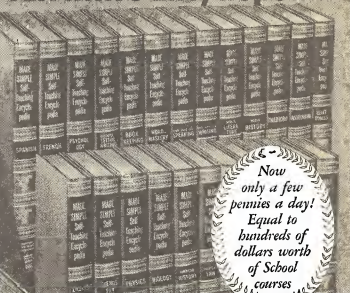
It clearly and quickly teaches you everything about this subject. There is no confusing language. You'll also use this book often as a handy reference. Sent On APPROVAL, at \$6.00 as we receive your reservation form.

FREE 10-DAY TRIAL RESERVATION CERTIFICATE

Made Simple Books Inc., Dept. A-135
220 Fifth Avenue, New York 1, N. Y.

Please receive in my name the luxurious, big-bound MADE SIMPLE 25-volume SELF-TEACHING encyclopedia. Send me the first book, **MATHEMATICS MADE SIMPLE**. I enclose NO MONEY IN ADVANCE, but within 10 days, if I decide to keep it, I will send only \$1.00 plus a few coast mailing charge and I will be entitled to receive each following handsome, De Luxe volume as it comes from the press, at the same low price, sending no money in advance. If not satisfied, I may return any book within ten days of receiving it. I may cancel my reservation at any time.

Name (If under 16, parent must sign below) _____
Address _____
City _____ Zone _____ State _____
Parent's Signature _____



Now
only a few
pennies a day!
Equal to
hundreds of
dollars worth
of School
courses

Now, Richly-Bound, Matched Library Volumes Use Everyday Situations to Teach Science, Business, Cultural and School Subjects; Assure Complete Mastery for Faster Job Advancement; Better School Grades; Richer, Fuller Living—In Just 15 Minutes a Day!

Now—the famous, proven MADE SIMPLE method offers you an education worth hundreds of dollars for pennies a day! Complete practical instruction in science, business and cultural subjects that you use every day for the children in school, mother at home, dad in his work and everybody in all their social contacts.

You can master these subjects in as little as 15 minutes a day, in weeks instead of years, with these books that are recommended by parents and noted educators for all age groups.

Learn Whenever You Want—Like Having Private Instructors in Your Own Home

This MADE SIMPLE SELF-TEACHING set is the only encyclopedia that makes important subjects part of your personal knowledge instead of having to look in books to solve every problem. It teaches subjects without dull, dry, everyday language. It's like having private instructors in your own home. Learn at your own pace. No outside work, nothing else to buy. The books start from the beginning, assume no previous knowledge and lead you quickly and carefully through the entire subject. Prepared by experts for adults working without supervision, they also perfectly supplement classroom texts, which contain confusing technical language.

**Beautiful Library Volumes
Perfect for Learning, Brush-Up,
Permanent Reference**

Whether you want to learn for the first time, review subjects you forgot or use for ever-ready reference, you could find no better set or price. These handsome 7 1/4 x 10 1/2 inch, 24-carat gold imprinted, matched library volumes are not digests or outlines. Every point is made absolutely clear by illustrations

and simple step-by-step explanations, using everyday situations. No self-answers to confuse you, no cross-references to make you use several books to get information. All the books teach you naturally, without memorizing long lists of rules.

Complete Explanations, Simple Illustrations Make Every Point Clear—No Previous Knowledge of the Subject Required

Here's how complicated subjects are MADE SIMPLE. In **PHYSICS MADE SIMPLE**, you are shown this simple home experiment, which costs nothing. Hold one edge of a letter paper against your chin, just below lower lip, with the paper hanging over and down. Blow above the paper and it will rise as if pulled up in the air stream. This simple principle makes airplanes fly and rockets move quickly and easily. Other books give you Bernoulli's Law, molecular action and other confusing terms. By the time you get to the experiment, if there was one, you wouldn't understand it. Here you read a simple explanation, do the experiment and then learn the technical terms, so you learn naturally, by doing, without memorizing anything. This has worked for many people who thought they were more hopeless than you may think you are.

You would say many times the price for much less beautiful and useful encyclopedias. But these books, with simple military and service tests, hundreds of illustrations, hundreds of safe, easy home experiments, thousands of pages of clear, concise, valuable instruction and self-tests with answers in the back, will be USED, ENJOYED and ADMIRER by all your family and friends.

Here is a brief description of all:

1. **MATHEMATICS MADE SIMPLE**. Described at last. 2. **ENGLISH MADE SIMPLE**. Shortcuts in learn grammar, spelling, punctuation, paragraphing, diction, usage, style, etc. 3. **CHEMISTRY MADE SIMPLE**. Learn about gases, liquids, solids, solutions, metals, minerals, organic and nuclear chemistry, electrolysis, etc.—even if you never finished high school. 4. **PHYSICS MADE SIMPLE**. How principles of mechanics, heat, sound, atomic energy, etc., help you better understand all life. 5. **BIOLOGY MADE SIMPLE**. Gain useful knowledge about nature, plant and animal, breeding, gardening and farming, dentistry, etc. 6. **AMERICAN HISTORY MADE SIMPLE**. History, traditions, thoughts and glories of the U.S. are brought vividly to life. 7. **EVERYDAY LAW MADE SIMPLE**. Business contracts, wills, partnership and corporations, marriage and divorce laws, and rights, court procedure, etc.—in simple language. 8. **SPANISH MADE SIMPLE**. 9. **GERMAN MADE SIMPLE**. An original, natural, enjoyable way to learn to speak, read and write the two most popular and valuable foreign languages. 10. **PSYCHOLOGY MADE SIMPLE**. How to use the mind. 11. **DIET MADE SIMPLE**. Nutritional patterns, shows you how to get along better with people and live better yourself. 12. **BUSINESS LETTER WRITING MADE SIMPLE**. How to apply for jobs, write correspondence, business letters, etc. 13. **BOOKKEEPING MADE SIMPLE**. New method for each memory of letters, journals, statements, trial balance, work sheet, profit and loss, etc. 14. **The Art of Speaking MADE SIMPLE**. 15. **The World Literature MADE SIMPLE**. 16. **World History MADE SIMPLE**. 17. **World History MADE SIMPLE**. 18. **Astronomy MADE SIMPLE**. 19. **Philosophy MADE SIMPLE**. 20. **Typography MADE SIMPLE**. 21. **The Background of the World MADE SIMPLE**. 22. **Illustrated MADE SIMPLE**. 23. **Illustrated MADE SIMPLE**. 24. **Revised Reading MADE SIMPLE**. 25. **Spelling MADE SIMPLE**.

SEND NO MONEY!

Get Your Reservation In Now
While the Supply Lasts!

BIG MONEY IN THE 4 CORNERS OF THE WORLD!

in TELEVISION, RADIO
ELECTRONICS, RADAR, SONAR

**ONLY CHRISTY OFFERS
COMPLETE TRAINING!**

Investigate the Christy Complete Course. Why be satisfied with less? CTS Shop Method, Home Training makes learning easy. You learn by working with actual equipment. You receive Comprehensive training from the start. Can EARN AS YOU LEARN. You become qualified to open your own Electronics Repair business or to gain high pay as a TV, Radio, Electronics, etc., Technician.

19 TRAINING KITS INCLUDED!
You receive a Multi-Tester, Oscillator, Signal Tracer, Oscilloscope, Signal Generator, Electronic Tuner, Regenerative Radio, 24" TV set (optional) and other valuable testing equipment. **FREE BOOK** and **TWO FREE LESSONS** yours for the asking! No obligation.

CHRISTY TRADES SCHOOL

Dept. T-3102, 3214 W. Lawrence Ave.
Chicago 25, Ill.

CHRISTY TRADES SCHOOL, Dept. T-3102
3214 W. Lawrence Ave., Chicago 25, Ill.

Please send me the 3 FREE BOOKS and Special Form for
PAYING LATER FROM EARNINGS MADE WHILE LEARNING.

NAME AGE

ADDRESS

CITY ZONE STATE



BIG EARNINGS WAITING Be a TYPEWRITER REPAIRMAN



Earn while you train at home to take your place in the booming field of typewriter repair. Skilled men are in demand. America needs thousands more for this multi-million dollar field. You can quickly step into a big-pay job or business of your own, full or part-time. Learn easily under expert guidance with clearly illustrated lessons. You work on a real typewriter, with professional tools, gain practical experience.

**FREE PROFESSIONAL
TOOLS, TYPEWRITER
SUPPLIED WITH COURSE**



**FREE BOOK SHOWS HOW
YOU CAN ENTER THIS
BIG OPPORTUNITY FIELD**

Send for the FREE book that gives you vital government facts about the urgent need for trained typewriter repair men and describes the vast opportunities waiting for you.

SEND COUPON NOW!

TYPEWRITER REPAIR SCHOOL, INC.
Dept. H-40, 150 Park Avenue
East Rutherford, New Jersey
Licensed by New Jersey
Dept. of Education

TYPEWRITER REPAIR SCHOOL, Dept. H-40

150 Park Avenue, E. Rutherford, N. J.

Please send Free Book "Opportunities Unlimited," at no obligation to me.

Name

Address

City Zone State

NEW! THE LATEST STYLE SENSATION BIKINI BRIEFS and TORSO 'T' SHIRT IN MATCHING COLORS

Continental inspired for style, maximum support and freedom of motion. Made of 100% absorbent combed cotton. The "T" Shirt is tapered to form fit on your body. Great for casual wear... accentuates your muscles. Briefs and "T" shirt are available in matching colors. Select from White, Red or Black. Sizes: Small, Medium and Large. Bikini Briefs @ \$1.35 ea. or 3 for \$3.50. Torso "T" @ \$2.00 ea. or 3 for \$5.50 post. Send \$2.00 Deposit on C.O.D.

SATISFACTION GUARANTEED

GRYSON PRODUCTS INC., Dept. U-14, 210 Fifth Ave., N.Y.C. 10



LEARN ANY DANCE IN 1 HOUR — GIANT FOOT CHARTS!

Now it's easy to learn any dance AT HOME in 1 HOUR with GIANT FOOT CHARTS. Place the Giant Foot Charts on floor. Left foot red, right foot black. Turn on radio—and START TO DANCE. You step from one to the other, following easy-to-understand directions. Simple as A-B-C. Anybody "catches on" in minutes—teenagers, husband and wife, or old folks. This NEW MODERN WAY will make a good dancer out of YOU! Gain new self-confidence and friends. Look GOOD on any dance floor. Be popular with dates. Avoid the embarrassment of not knowing the "latest steps". Learn over 30 new steps... each course includes 100 pictures. Send \$1 plus \$6 handling — get 1 complete American-Style Dance Course including Fox Trot, Jitterbug, and Waltz. SPECIAL OFFER: Send \$2 plus \$6 handling (\$2.50 total) and get BOTH American-Style and Latin-American Courses including Cha-Cha-Cha, Rhumba, Tango, Mambo, and Merengue. (NECESSARY GIANT FOOT CHARTS INCLUDED.) Satisfaction Guaranteed—or return courses and Money Refunded. Send \$2.50 cash or check (leave c.o.d. fee). **ORDER TODAY!**

FAMOUS DANCE COURSE, Dept A-1, Box 5095, Miami 1, Fla.

COMBO WATCH STOP WATCH



Precision Workmanship. Imported SWISS Movement. Guaranteed TWO YEARS. Chrome and Stainless steel case • Radius Hands • Shock-Resistant • Sweep Hand • Measures Distance Speed of Cars, Planes and other moving objects • A Timekeeper—TELEMETER—TACHOMETER • Includes 45 minute and 6-Hour Registers, Jeweled Movement Available in Chrome or Gold Case. Full Operating Instructions • TEN DAY Money Back Unconditional Guarantee.

ONLY \$9.95 Prepaid Delivery Order Today

CRYDER SALES CORP.

DEPT. C-69 WHITESTONE 57, N. Y.

YOU CAN HAVE A HE-MAN VOICE

STRENGTHEN your voice this tested, scientific way. Yes—you may be able to improve the POWER of your speaking and singing voice... in the privacy of your room! Self-training lessons, mostly silent. No music required.

FREE BOOKLET

Write today for Eugene Feuchtinger's great booklet "How to Develop a Successful Voice." It's absolutely FREE! You must state your age. Booklet mailed postpaid in plain sealed envelope. No salesman will bother you. Send your name and age RIGHT NOW!

Perfect Voice Institute 210 S. Clinton St. Studio HP-4 Chicago 6, Ill.



FREE MUSCLE BUILDING INFORMATION

Sensational New Methods

Less Time—Less Effort—Better results

BODY-TONE, Box 636 R., North Miami 41, Fla.

DON'T BE HALF-TRAINED!

Be A Master Technician

NOW...ONE
modern master
home training course
IN ALL 3 PHASES



AIR CONDITIONING-REFRIGERATION ELECTRICAL APPLIANCES

**ALL AT ONE
LOW TUITION**

only
National Technical Schools
gives you this complete
training at no extra cost

YOU GET AND KEEP ALL THESE TOOLS AND INSTRUMENTS



Incomplete training limits your earning power, even disqualifies you for top-pay jobs. The big service companies require complete, all-phase training. If you open your own shop, you'll be called upon to service and repair all types of refrigerators, air conditioners and appliances. With complete training—as only National Technical Schools can give you—you can accept every job, make big profits all year round.

FUTURE BRIGHT FOR TRAINED MASTER TECHNICIANS

Over 30,000 new technicians must be trained annually. You are needed to help service and repair the 50 million air conditioners, refrigerators and electrical appliances that will need fixing this year alone. No wonder the Master Technician has steady work, at high pay, year after year. He can go places in his own business or with a manufacturer, dealer, distributor or department store. Armed with all-phase training, his earning power is unlimited.

THE MOST FOR LESS

We give you Illustrated Shop-Tested Lessons and Manuals...many other training aids...privilege of CONSULTATION with our instructors and engineers. Every lesson, every manual has been SHOP tested and approved.

JOB TRAINING AT HOME

You get Professional Tools, Precision Instruments, PLUS a Factory-Made APPLIANCE TESTER! A shop-full of PRACTICAL, professional equipment. Use them to conduct over 100 experiments...also in Spare Time Work and ON THE JOB. It's all yours to keep...no EXTRA MONEY DEPOSITS...no EXTRA COST on your equipment kits.

EARN AS YOU LEARN

We show you how. Many of our students pay for their entire course—and more—in Spare Time while learning. So can you. Graduate Advisory Service, too.

**GET THE BENEFIT OF OUR OVER
50 YEARS EXPERIENCE**

**N.T.S. also offers training in
TV — RADIO — ELECTRONICS
and AUTO MECHANICS — DIESEL**

NATIONAL TECHNICAL SCHOOLS
WORLD-WIDE TRAINING SINCE 1905
4000 SO. FIGUEROA ST., LOS ANGELES 37, CALIF., U.S.A.

RESIDENT TRAINING AT LOS ANGELES

If you wish to take your training in our Resident School at Los Angeles, start NOW in our big modern Shops and Labs. Here you work with latest equipment...professionally installed...finest, most complete facilities offered by any school. Expert, friendly instructors. Personal attention. Graduate Advisory Service. Help in finding home near school...and part time job while you learn. Check box in coupon for full information.



**SEND FOR
FREE
BOOK AND
ACTUAL
LESSON NOW!**

We'll rush you our big, Illustrated OPPORTUNITY BOOK and ACTUAL LESSON, show you how easily you can learn. NO OBLIGATION; no salesman will call. Do it NOW! It costs nothing to find out.

NATIONAL TECHNICAL SCHOOLS
WORLD-WIDE TRAINING SINCE 1905

MAIL NOW TO
National Technical Schools, Dept. CP-70
4000 S. Figueroa St., Los Angeles 37, Calif.
Rush FREE Air Conditioning-Refrigeration-Electrical Appliances "Opportunity" Book and Actual Lesson. No Salesman will call.

NAME _____ AGE _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

☐ Check here if interested ONLY in Resident Training at Los Angeles.



BE YOUR OWN MUSIC TEACHER

Send for Free School Catalog Telling How Easily You Can Learn Piano, Guitar, Accordion, ANY Instrument This EASY A-B-C Way.

NOW IT'S EASY to learn music at home. No tire-some "exercises." No teacher. Just START RIGHT OUT playing simple pieces. Thousands now play who never thought they could. Our pictured lessons make it easy to A-B-C to learn to play popular music, hymns, classical and any other music. Only a few cents a lesson. Over 1,000,000 students including TV star Lawrence Welk. (Established 1898, Licensed by N. Y. State Education Dept.)

MAIL COUPON FOR FREE SCHOOL CATALOG

Find out why our course can teach you quickly, easily, inexpensively. Write for 36-page illustrated Free Catalog. No obligation. No salesman will call. Just mail coupon below today!

U. S. SCHOOL OF MUSIC
STUDIO 768
Port Washington, N. Y.

U. S. SCHOOL OF MUSIC
Studio 768, Port Washington, N. Y.

Please send me your 36-page illustrated Free School Catalog.

Name (Please Print)

Address

City Zone State

WANTED!

**Mechanically Inclined
Men to Qualify for
BIG PAY JOBS
AND SPECIAL FACTORY
TRAINING IN DIESEL**

"We need qualified repairmen, operators, mechanics NOW!" say Diesel Manufacturers, Highway Builders, Truck Line Operators in every corner of America. Can you qualify for these High Pay Jobs? We can help you! Interstate's General Course and Cummins-approved Diesel home-training courses are internationally recognized. Advisory placement service for trainees. Don't wait. Men are needed NOW!

Get the Facts Today!

WRITE INTERSTATE TRAINING SERVICE

Dept. A-8, Portland 12, Oregon

Rush information on I.T.S. Diesel Courses, Special Factory Training and Diesel Job Opportunities.

Name

Address

City Zone State



**FINISH HIGH SCHOOL AT HOME
IN YOUR SPARE TIME**

DIPLOMA AWARDED
Learn more! Earn more! Enter professional or technical schools. Advance socially. Live a happier, fuller life. Individual Courses or complete schedule. Write for School Bulletin.

ACADEMY FOR ADULTS

30 W. Washington, Dept. SM-760, Chicago, Ill.

NEW-WHIRLING HYPNO-COIN HELPS HYPNOTIZE OTHERS IN MINUTES!

FASCINATING POCKET-SIZE INVENTION.
Hold the plastic HYPNO-COIN in front of the person you want to hypnotize. Then, make the hypnotic pattern whirl by gently vibrating the coin. This whirling motion is so fascinating, so eye arresting . . . it captures and holds your subject's gaze. Now—you are ready to hypnotize. Get this amazing hypnotic aid plus a free revealing booklet of secrets and instructions. It tells you what to say and do, how to command, how to re-hypnotize with the snap of a finger. Also—entertaining facts that will thrill and amaze them at parties. Both the COIN and Booklet—only \$1.00 post. Sent in plain wrapper. Your money back if not delighted.

**GUARANTEE
\$1.00**

HYPNOTIC-AIDS • Dept. 7-SM 1133 Broadway, N.Y.C. 10

engineering degree in 27 months

Grab your chance for a better life. Rapid Advancement. Better Income. **BACHELOR OF SCIENCE DEGREE IN 27 MONTHS** in Elect. (Electronics or Power major), Mech., Civil, Aero., Chem. Engineering. IN 36 MONTHS in Business Administration (General Business, Accounting, Motor Transport Mgt. majors). Small classes. More professional class hours. Well-equipped labs. Campus Dorms. Modest costs. Year-round operation. Founded 1914. Enroll Sept., Jan., Mar., July. Write J. J. McCarthy, Director of Admissions, for catalog and "Your Career in Engineering and Commerce" Book.

TRI-STATE COLLEGE 780 College Avenue
Angelo, Indiana

locksmithing and key making

PRACTICAL UP-TO-DATE COURSE—ONLY \$5.95



Teaches you how to pick locks, de-jacks, make master keys, repair, install, service, etc. New self-instruction lesson for every handyman, homeowner, carpenter, mechanic, service station operator, etc. Illustrated lessons. Full price only \$5.95, postpaid; or 6.00 p.d. plus mail. Satisfaction or refund guaranteed. Mail order today!

NELSON-HALL CO., Dept. HP-4
210 S. Clinton St. Chicago 6, Ill.

WHOLESALE Electric Guitars—Parts—Factory to You

Solid-body Spanish, amplifiers, tone changer guitars, double-necks, single-necks, triple-necks, solid-body mandolin, pickup mikes, non-electric instruments, etc. 1,800 Models wholesale. **WHEEL CATALOG**. Free home study course with instruments. Parts and plans available to build your own.

CARVIN CO., Box 287, SM, Covina, Calif.

ANALYZE HANDWRITING

**MORE INCOME . . . MORE PRESTIGE
AND MORE SUCCESS!**

FASCINATING, uncrowded profession—business, full or parttime. Learn grapho analysis at home. Amazing opportunities for both men and women. Write postcard or short letter for FREE revealing analysis of your own handwriting! We'll also send free lesson and details. No obligation. (State age.)

International Grapho Analysis Society, Inc.

Dept. 4, Springfield 4, Missouri

Learn PHOTOGRAPHY at Home

Stupendous opportunities. Prepare in spare time. Practical basic training. Long-established school. Send for free book, "Opportunities in Photography." **WHEEL CATALOG**. American School of Photography, 835 Diversy Parkway, Dept. 173C, Chicago 14, Ill.

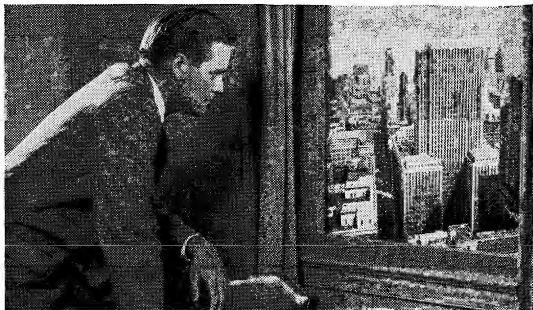
STOP SUFFERING AND START LIVING

**WEB GUARANTEES IMMEDIATE, LASTING
RUPTURE RELIEF
—OR YOUR MONEY BACK IN FULL!**

Enjoy a stronger, happier life. Wear a Web for strong support and lasting relief of reducible inguinal rupture. If not completely satisfied return within 30 days for full refund of purchase price. **WRITE FOR FREE BOOK ON RUPTURE CARE**

WEB TRUSS CO. DEPT SM-8
HAGERSTOWN, MD.

CAN YOU STAND THE IMPACT OF CRITICAL YEARS AHEAD?



Know What to do . . . and When to do it!

Whether you are a butcher, baker or candlestick maker, *your life isn't going to be the same.* The most astounding transformations—unexpected changes—are going to alter your ways of living in the next few years. Millions have been expecting a change—but few will be ready for it. *Avoid the confusion, the disillusionment* that will come to those unprepared.

Let the Rosicrucians show you how to develop your intuitive powers, your unsuspected talents, into *new, useful abilities.* Prepare to meet the demands that will be made upon you for it will be too late to say "I always thought—I believed—because we've always done it this way before!"

Accept this Free Book

The Rosicrucians are an age-old group of thinking men and women, devoted to helping man understand himself and to pointing out how he may *adjust his capabilities* to the world in which he lives. They offer you a **FREE** copy of their fascinating book, *The Mastery of Life*. It will tell you in *simple language* how you can prepare yourself and your family for the critical years ahead—and how you can attain *self-sufficiency*. Address: Scribe T.H.W.

The ROSICRUCIANS

(AMORC)

San Jose, California

The Rosicrucians are NOT a religious organization

Scribe T.H.W.
The Rosicrucians
San Jose, California

I am sincerely interested in learning how The Rosicrucians can help prepare me for the critical years ahead. Please send me a copy of the book, *The Mastery of Life*, I understand there's no obligation.

Name _____

Address _____

City _____

FREE! AIRMAILS!



Fabulous collection of all-different genuine Airmail Stamps from remote corners of the world — Africa, Europe, Exotic Orient, everywhere! World's Largest Airmail, Flying Doctor, Bomber, \$2.00 Helicopter, many others. PLUS Collection of thrilling Space-Age stamps . . . Sputniks, Jets, fantastic Moon Rocket stamps. Both of these remarkable collections — containing stamps worth up to 25¢ each! — for only 10¢ to cover mailing costs. Extra! Other sensational stamps for your free examination, plus Big Bargain Catalog, Rush 10¢ today to:

Jamestown Stamp Co., Dept. F705M, Jamestown, New York
RUSH my Free Airmail Collection and other offers.
I enclose 10¢ for mailing costs.
PLEASE PRINT

Name

Address

City & State

.....

AVIATION CAREER

SPECIALIZED EDUCATION / PROFESSIONAL TRAINING...only 16 months to 2 years

Top-pay prestige positions, bright future in aviation. Job opportunities waiting for you as soon as you're ready. Airframe and Powerplant Technician, Aeronautical Engineering Technician, Business or Executive Pilot, Classes in Miami.

SEND FOR FREE 80-PAGE BOOK

Embry-Riddle Aeronautical Institute
Dept. T Miami, Florida (Founded 1926)

Name

Address

City

State

ELECTRONICS

Train in the new shop-labs of the world famous
COYNE ELECTRICAL SCHOOL on a quarter of a million dollars worth of equipment or learn at home in your spare time with Coyne's modern television training.

Use this coupon to get our free book
"GUIDE TO CAREERS"

COYNE ELECTRICAL SCHOOL

1501 W. Congress Pkwy.

Chicago 7, Ill., Dept. of Electronics IV

NAME

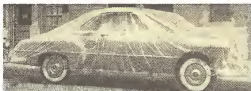
ADDRESS

CITY

☐ Training at Coyne

☐ Training at home

Unlike most other schools, we do not employ salesmen.



PORTABLE GARAGE—Keeps rain, snow, dust, salt air, sun or sleet away. Protects the finish of your car. Durably constructed of vinyl plastic that is long wearing and tough. Fits all makes and models; elasticized bottom holds securely. Comes to you direct from the manufacturer. 10-day money back guarantee. \$10.95 (add 65¢ postage). Cryder Sales Corp., Dept. BB-80, Box 79, Whitestone 57, N. Y.

BECOME AN EXPERT IN TRAFFIC

Men trained in Traffic Management earn top pay. Thousands of firms need experts on rates, tariffs, regulations. We train you thoroughly in spare time for executive traffic jobs. Persons working under traffic authorities. Placement counsel and help. Write for free book "Traffic & Transportation".

LASALLE Extension University, 417 So. Dearborn Street
A Correspondence Institution Dept. 4607, Chicago 5, Ill.

PELLET FIRING

LUGER AUTOMATIC

- MAGAZINE LOADING CLIP
- OVER 15 MOVING PARTS
- FULLY AUTOMATIC

ONLY

\$198

Automatic full size model of a Luger Automatic pistol—containing over 15 moving parts. Loads 8 complete rounds which snap into the barrel but simulating a Luger. Fires 8 bullet shaped pellets. Has automatic slide action.

MOST AUTHENTIC MODEL GUN WE'VE EVER SEEN

Comes to you with working parts, full instructions, supply of pellets and specially designed belt holster. Full Money Back Guarantee. Simply send \$1.98 plus 27¢ shipping charge or order C.O.D. From:

HONOR HOUSE PROD. CORP., Dept. LL-46, Lymbrook, N. Y.

PIANO TUNING

Experienced piano tuners charge up to \$10.00 for a job they finish in about an hour. Repeat business, too! You can start training for this profitable field right now. It is NOT necessary that you play piano . . . you don't even have to understand music at all. **SELF-INSTRUCTION COURSE**—only \$4.95 complete price. This excellent home-study course includes instructions on piano regulating, repairing—other servicing operations every good piano tuner knows. Also covers electric organs, tuning by Stroboscope, etc. Good, clear, helpful illustrations to guide you step-by-step. Money-back Guarantee. Full price only \$4.95 postpaid—or C.O.D. plus postage. Order Dept. 44-A, Chicago 5, Ill.

"Piano Tuning Course" today! Nelson-Mell Co., 240 S. Clinton St., Dept. 44-A, Chicago 5, Ill.

GIANT MAGIC CATALOG



BE THE LIFE OF THE PARTY

ENTERTAIN WITH 800 NEW MAGIC TRICKS

Mystery—astonish others. Have fun. Be the life of the party. Make money in spare time too! (Summer Special!) Rush \$2.00 now—today for this \$1.00 Giant Deluxe 160-page Magic and Fun Catalog. Loaded with Magic, Pocket Tricks, Mysteries, Illusions, Secrets, Mindreading, Hypnotism, Party Stunts, Joker's Novelties, Puzzles, Riddles, etc. Low prices. Everything illustrated! Rush name, address, and 25¢.

FREE MAGIC TRICK CATALOG

HOUSE OF A THOUSAND MYSTERIES, Dept. 5MR, Trumbull, Conn.

REAL ESTATE BE A BROKER

PAY \$20! SEND FOR FREE, BIG, ILLUSTRATED CATALOG NOW! Graduates report making substantial incomes. Find out your own business quickly. Men, women of all ages. Earn easily. Course covers Sales, Property Management, Appraising, Loans, Mortgage, and related subjects. **STUDY AT HOME** or in classroom in leading cities. Diploma awarded. Write TODAY for free book! No obligation.

Approved for World War II and Korean Veterans
WEAVER SCHOOL OF REAL ESTATE (Est. 1936)
2020U Grand Kansas City, Mo.

FREE BOOK TELLS HOW

WHAT ALL AUTO REPAIR GUIDS WANT TO KNOW

AUTOMOBILE REPAIR GUIDE
MECHANICS
 This Big Practical Book gives full information, with working diagrams, covering the principles, construction, operation, and repair of modern cars, trucks and buses.
 Air Conditioners, Hydraulic & Fluid Drives Fully Explained.
 A wide range of illustrations, including 1132 pages, with over 1000 illustrations showing inside and outside views of the engine, parts, with instructions for service jobs.
 Completely up-to-the-minute.
 Priced at only \$6.
CIRCLE No. 1 IN COUPON

HOME APPLIANCES

HOW TO FIX
REFRIGERATORS
WASHERS
TOASTERS
DEYERS
IRONERS
RANGES
VACUUMS
FREEZERS
 Many others
AS AND ELECTRIC APPLIANCES
 Handy References for Electric & Gas Servicers, Mechanics, Dealers and Home-owners. Explains how and exactly how to locate trouble, how to test, reasonable and correct. Working drawings, 1000 Pages. Easy to read, covers all modern appliances. 164 Pages. Illustrated. Only \$6.
CIRCLE No. 2 IN COUPON

TV TELLS HOW TO ANSWER RADIO RADIO TV QUESTIONS SERVICE LIBRARY

AUTOMOBILE REPAIR GUIDE
RADIO TV
TECHNICAL SERVICE LIBRARY
 HERE IS LATE INFORMATION IN THE RADIO AND TELEVISION REPAIR, SERVICING AND STUDENTS.
 TWO COMPLETE VOLUMES—1568 Pages—1000 Illustrations and 1000 Pictures in Modern TV, Radio, Transistors & Transistors Circuits, Rectifiers, Record Changers, P.A. Systems, Phonograph, F.M. Auto Radio, Short Wave.
 Basic principles, Construction, Installation, Operation, Troubleshooting, How to test, Sharp, Clear TV Pictures, Install Antennas, How to Test, Explains COLOR SYSTEMS, Methods of Conversion, and other details. Includes Ultra High Frequency. Quick and easy reference or use as a home study course. Only \$8 for BOTH volumes.
CIRCLE No. 3 IN COUPON

OIL BURNERS

New complete, explaining in detail both domestic and industrial oil burners. Includes electrical hook-ups and wiring diagrams. Fully covering the theory, construction, installation, operation, testing, servicing and repair of all equipment. Used for ready reference. Over 416 Pages. 250 Illustrations and Diagrams. Only \$2.
CIRCLE No. 28 IN COUPON

ALL TYPES OF BLUEPRINT READING

How to read scales, the standard symbols, detail and assembly prints, working drawings, short cuts, help, hints and suggestions. THIS IS THE ONLY BOOK IN THE LINE FOR A BETTER JOB. This book gives you the secret language, why, how, when, what, how, 448 Pages. Very Fully Illustrated. Priced at \$3.
CIRCLE No. 25 IN COUPON

PLUMBERS AND STEAMFITTERS GUIDES

Practical Trade Assistant & Reference Set. Explains in plain language and by clear illustrations, diagrams, charts, graphs and pictures the principles of plumbing and steamfitting. Including Pipe Fitting and Air Conditioning. 4 Vols.—3624 Pages—3642 Diagrams and Illustrations. Only \$8 for the complete set of 4 vols.
CIRCLE No. 6 IN COUPON

7-DAY FREE EXAMINATION

SEND NO MONEY—Pay the postage nothing! We are glad to send you any of the Audel Guides for absolutely FREE examination in your own home. We will take all your money and leave all the discounts up to YOU. There is no obligation. You decide how long the book of your choice you may keep for then under our outstanding return plan of only \$2 a month.

HERE IS ALL YOU DO

IT'S EASY TO ORDER: In the No-Risk Mail Order Coupon at the right just draw a circle around the number and Audel Guide you want us to send you for FREE EXAMINATION. We will send them to you at once to help you build a brighter future by increasing your SKILLS. If for any reason at all you are not completely satisfied, return the books to us, and that will end the matter! NO STRINGS OR CATCHES TO THIS OFFER.

THEO. AUDEL & CO.
 49 West 23rd Street, New York 10, N.Y.

MECHANICAL AND BUILDERS GUIDES

MECHANICAL STOREHOUSE OF KNOWLEDGE
MECHANICAL CONSTRUCTION INFORMATION (4 vol. set) for repairmen and all woodworkers. Explains in easy language and by precise illustrations principles, advance, short cuts, test records, all based on the NEWEST information.
 Vol. 1—Tools, measure, square, saw files, layout, fastenings, etc.
 Vol. 2—Builder's mathematics, drawing, plans, specifications, estimates, etc.
 Vol. 3—House and roof framing, girders, foundations, etc.
 Vol. 4—Doors, windows, stair building, millwork, painting, etc.
 4 vols. 1946 Pages. 2000 Illustrations. Priced at only \$6.
CIRCLE No. 8 IN COUPON

PRACTICAL ELECTRICITY

A COMPLETE HANDBOOK—Quick, simplified, ready reference. Complete instruction and practical information on the rules and laws of electricity—Maintenance of Machinery—A.C. and D.C. Motors—Armatures—Wiring Diagrams—House Lighting—Power Wiring—Motors—Batteries—Transformers—etc. Simple to understand. 1032 Pages. 2600 Illustrations. Priced at \$5.
CIRCLE No. 12 IN COUPON

DIESEL

ALL THERE IS TO KNOW ABOUT MODERN DIESEL ENGINES—Basic principles, starting valves, timing, fuel pumps, fuel injection, compressor, accessories, pistons, cylinders, lubrication, cooling systems, etc. Answers on operation, calculations. 640 Pages. Fully Illustrated. Priced \$5.
CIRCLE No. 9 IN COUPON

MASONRY & BUILDERS GUIDES

A PRACTICAL ILLUSTRATED 4 VOL. SET—Explaining in clear, simple, and concise illustrations principles, advance, short cuts, trade secrets, based on modern practice. Includes how to figure and calculate various jobs. Vol. 1—Block work, bricklaying, bonding, design. Vol. 2—Brick foundations, arches, setting, estimating. Vol. 3—Concrete masonry, plastering, form, setting, shoring. Vol. 4—Roofing, foundations, masonry, steel construction, blueprinting. 4 vols. 1440 Pages. 2067 Illustrations. Complete Set only \$6.
CIRCLE No. 26 IN COUPON

MATHEMATICS MADE EASY

A COMPLETE HOME STUDY COURSE—Explains in plain language and by precise illustrations principles, advance, step by step, the various stages of mathematics, including the rules and calculations for mechanical and electrical problems. New EASY correct methods. Includes plain and solid geometry, trigonometry, algebra, calculus, etc. Practical tests, reference tables and data. How to use slide rule. 672 Pages. 350 Illustrations. Priced at only \$3.
CIRCLE No. 11 IN COUPON

NEW MACHINISTS AND TOOLMAKERS HANDBOOK

MODERN MACHINE SHOP PRACTICE—For every Machinist, Toolmaker, Draftsman or Student. Tells how to set up and operate lathes, screw and milling machines, shapers, drill presses and all other machine tools. A COMPLETE INSTRUCTOR AND REFERENCE BOOK 1250 Pages. Fully Illustrated. Priced at only \$6.
CIRCLE No. 12 IN COUPON

ELECTRIC MOTORS

THIS GUIDE covers the construction, hook-up, control, maintenance and trouble shooting of all types of motors. Includes armature winding. Explains entire subject in great detail. Set in simple language. Over 1050 Pages of information. 617 Diagrams. All types of motors. Tested and indexed for ready reference. Priced at only \$5.
CIRCLE No. 27 IN COUPON

REFRIGERATION & AIR CONDITIONING

FOUR BOOKS IN ONE—Basic principles, servicing, operation, repair of: 1. Household Refrigeration. 2. Special Refrigeration Units. 3. Commercial & Industrial Refrigeration. 4. Air Conditioning and Air Gases. G.O.M. MINE of essential information. Completely up-to-date. 1560 Pages. Fully Illustrated and Indexed. Priced at only \$6.
CIRCLE No. 14 IN COUPON

MAIL THIS NO-RISK COUPON TODAY!

THEO. AUDEL & CO.—Self Improvement Publishers Since 1879—

49 W. 23rd Street, New York 10, N.Y.

Please mail me 7 days' FREE EXAMINATION the books I have circled at right. I agree to mail \$2 in 7 days on each book or set ordered, and to further mail \$2 a month on each book or set ordered until I have paid the purchase price, plus shipping costs. If I am not completely satisfied with my Audel Guides I may return them.

NAME _____

ADDRESS _____

OCCUPATION _____

EMPLOYED BY _____

☐ SAVE SHIPPING COSTS! Check here if you enclose complete payment with order. We pay postage charges. You have some return privilege.

MECHANICAL DICTIONARY

THE AUTHORITY WORD BOOK FOR MECHANICS TECHNICIANS AND STUDENTS
 With the revolutionary progress being made today in mechanical fields, new words and phrases come into use. Any mechanic who wants to be up to date must know this new term language.
 Audel's New Mechanical Dictionary gives you all these new words and also the meanings. Every mechanic will find his job made easier if he knows the exact meaning and use of technical terms. It is an engineer's shop companion and a student's guide.
TABLES, FORMULAS, PROCESSES AND
 Constant use of Audel's New Mechanical Dictionary will increase your knowledge and skill in a matter of days without any conscious effort on your part. The right word at the right time is like the right tool—be sure you have it and use it! Defines 17,000 terms phrases—rules and formulas. 712 pages only \$5.95.
CIRCLE No. 44 IN COUPON

THE NEW ELECTRIC LIBRARY

A COMPLETE ENCYCLOPEDIA explaining the simplest terms the fundamental principles, rules and applications of applied electricity.
A COMPLETE COLLEGE EDUCATION!
 Fully illustrated with diagrams and sketches, calculations and tables for ready reference. Questions and answers. Trial test for practice study and review. All based on the most modern theory.
 Vol. 1—Principles and rules of electricity, magnetism, armatures, repairs. No. 15
 Vol. 2—Dynamics, DC. Motors, magnetism, induction, telegraph, telephone, telegraph, electric pictures. No. 23
 Vol. 3—Relay, communication, instrumentation, welding, x-ray, control, and repair. No. 17
 Vol. 4—Alternating current, power factor, alternators, transformers. No. 18
 Vol. 5—A.C. Motors, winding, maintenance, converters, etc. No. 19
 Vol. 6—Relays, communication, regulation, rectifiers, meters, microswitches, etc. No. 20
 Vol. 7—Wiring, house light and power, circuits, etc.
 Vol. 8—Covers Electric, Organ, welding for sheet metal, spot and pipe weld, pressure vessels and aluminum, copper, brass, bronze and other metals. Airplane work, surface hardening, hard facing, cutting, brazing, etc. 608 Pages. Fully Illustrated. Priced \$3.
CIRCLE No. 10 IN COUPON

ADDITIONAL IMPORTANT TITLES

The following Audel Guides are all the best in their fields, written in clear simple language, all lavishly illustrated. Circle the numbers wanted in the MAIL ORDER COUPON below. All books are sent for FREE EXAMINATION.

No. 5 TRUCK & TRACTOR GUIDE. 1876 Pages.	\$2.00
No. 16 PAINTING & DECORATING MANUAL. 417 Pages.	3.00
No. 13 WIRING DIAGRAMS (Light & Power). 204 Pages.	2.00
No. 29 SHEET METAL PATENT LATHES. 1152 Pages.	7.50
No. 30 SHEET METAL WORKERS HANDBOOK. 448 Pages.	2.00
No. 31 MECHANICAL DRAWING GUIDE. 192 Pages.	2.00
No. 32 MECHANICAL DRAWING AND DESIGN. 410 Pages.	3.00
No. 33 ELECTRONIC DEVICES. 304 Pages.	3.00
No. 34 ELECTRICIANS EXAMINATIONS. 272 Pages.	2.50
No. 35 ELECTRIC POWER CALCULATIONS. 482 Pages.	3.00
No. 36 ELECTRIC DICTIONARY. 9000 Terms.	3.00
No. 27 POWER PLANT ENGINEERS GUIDE. 1568 Pages.	5.00
No. 28 THERMICS AND FURNACE EXAMS. 564 Pages.	3.00
No. 29 OPERATING ENGINEERS LIBRARY. 3 Book Set.	12.00
No. 40 PUMPS, HYDRAULICS AND AIR COMPRESSORS. 410 Pages.	6.00
No. 41 HOUSE HEATING GUIDE. 866 Pages.	5.00
No. 42 MILLWHEELS & MECHANICS GUIDE. 1248 Pages.	5.00
No. 43 DO-IT-YOURSELF ENCYCLOPEDIA. 2 Book Set.	8.95

READERS' ROUND TABLE

This department is conducted by our readers, and every one of you is invited to write for publication. Give us your views, ideas, questions and suggestions, and show and tell your fellow readers about the interesting projects you have built. We want you to feel this is your magazine—a publication shaped by its readers—so don't hesitate to write us frankly just how you like it. Address your letters to Readers' Round Table Science and Mechanics, 450 East Ohio Street, Chicago 11, Illinois.



Yard Gun

Made this cannon from the Apr. '60 S&M plans for the centennial model Civil War Parrott Rifle. Your plan was scaled $\frac{3}{4}$ -in.

Have always wanted one for decoration in my yard, so I used your plans, but made mine $3\frac{3}{4}$ -in. to the foot.

Route 2

L. F. SMITH

Petoskey, Michigan

She's a beaut. Might also help to discourage unwelcome salesmen.

Bearcat Builder

Here is a picture of the Stutz Bearcat built from your Craft Print 280. Am enclosing my order for another Craft Print 280.

9422 N. E. 14th St.

F. SCHMITZ

Bellevue, Washington

Did someone borrow the original craft print—and forget to return it?



Sharp Boy for \$236

My *Playboy* (Craft Print 201) sure is a sharp boat, very easy to build and fine for the whole family. Total cost, including fiber-glassed bottom, foam-rubber covered seats, speedometer, steering gear, windshield and all extras, was \$236.

Floor planking is sawed a little narrow so it may be slipped up between the side seats and not screwed in place; this permits fast, easy cleaning of inside bottom of boat.

Powered with a 35-hp Evinrude, top speed



is 32 mph with two aboard. With my wife, our five children and myself aboard she does 26 mph. I intend to build Sea Babe cabin cruiser, as soon as the new Carlyle Lake is finished. Enclosed is an order for Craft Print 239, (*Sea Rover*), 253 (*Lawn Furniture*) and 256 (*Hasty Hornet, Jr.*). The 253 and 256 plans are for my sons' 4-H projects.

R. R. 1

MAURICE HUSTEDDE

Carlyle, Illinois

Sounds as if there are no idlers in your family, Maury. We'd like to see close-up photos of each of these projects when they're completed.

About the New S&M

Count this as a request for more bonus blueprints. They are great.

Shakopee, Minn.

JIM COX

Congratulations on the changes in scope of your new magazine—the increases in size and frequency of publication are in order and the new price is O.K., too.

9411 95th Street

VICTOR D. DRESSNER

Woodhaven, N. Y.

Don't wish you were a **WATCH REPAIRMAN**

Be one NOW!

Opportunities for full or part time earnings are the best in years

Make rapid progress the Swezey Way



CHICAGO SCHOOL OF WATCHMAKING *will train you at home in your spare time*

Get set now for lifetime security or a business of your own. Have a second trade for emergencies or after retirement. Watch repairing is light, clean, fascinating. It frees you from the dull drudgery of tiresome or back breaking work. It offers excellent opportunities now for full or part time earnings.

Complete professional instruction for only \$5 a month

No need to leave home or job. Learn in spare time. Chicago School of Watchmaking's exclusive Swezey System shows you step by step how to repair all types of Swiss and American watches. It's practical, shop method training. You work with watches from your very first lesson. You need no previous experience. Age is no barrier. Diploma awarded. Send today for free sample lesson and complete information. No obligation, of course. No salesman will call.

CSW has been training men and women for this trade since 1908

Why not be one of our successful graduates? Learn how Chicago School's streamlined home training can speed your success.

Member, National Home Study Council

CHICAGO SCHOOL OF WATCHMAKING

Founded 1908

2330 MILWAUKEE AVE., CHICAGO 47, ILL.

**MAIL
COUPON
TODAY!**

FREE SAMPLE LESSON

CHICAGO SCHOOL OF WATCHMAKING

2330 N. Milwaukee Avenue, Dept. 680, Chicago 47, Illinois

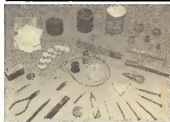
Please rush **FREE SAMPLE LESSON** and full information to tell me how I can learn watch repairing at home.

NAMEAGE

ADDRESS

CITYZONESTATE

SPECIAL TOOLS PROVIDED



This set of tools is offered in your course at no extra tuition cost. They enable you to start repairing right away.

The greatest and noblest since your first issue. Never thought you could expand and yet keep it nice and newsy.

3804 N. Sawyer
Chicago, Illinois

FRANK STEMPAK

April '60 S&M excellent. Like construction articles. Keep up the good work.

1438 Cullom Ave.
Chicago 13, Ill.

R. M. SCHULTZ

Always thought your mag was tops in the field. Now you have outdone yourself—your April '60 issue was terrific.

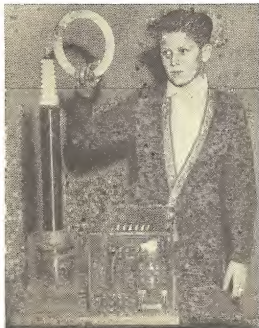
I have started the shop bench spot welder, and am eagerly awaiting the June issue so I can complete it. Keep the projects coming—I enjoy them all.

Calle Soledad 114 Pda. 17 JAMES C. SHELDON
Santurce, Puerto Rico

We want a good, closeup glossy photo of that welder in action, Jim, as soon as you've finished it.

Tesla Coil Winner

With your Tesla Coil (Craft Print 191) I won first prize in our school Science Fair last year. To earn the money (about \$65) I raked leaves and served papers. I used surplus capacitors which cost me \$7.50. Not having a lathe to wind the secondary coil, I made one and, while I turned the crank, my father fed the wire on the Plexiglas tube. In order to count each winding we put an arm on the end of the tube. Each time it turned it would



move a disc numbered from 1 to 10. Each time the disc made one complete turn we would turn another one that was in tens to 100. When that went around 18 times we had 1800 turns. This took about 10 hours to wind. To make the entire coil took about 60 hours.

This year I am going to make the repulsion coil (Craft Print #227).

837 Quinton Ave.
Trenton 9, N. J.

ROBERT WOLFF

Your prize was well earned, Bob. Good luck on this year's project. If you can add one original experiment to your repulsion coil project, the judges should be mightily impressed.

Taller Wheelhouse

I made one major change in this *Sea Hawk* (Craft Print 282). I'm 5 ft. 11 in. so I raised the wheelhouse height 5 in. which allows me to stand straight under it. To keep the same proportions and slope on the windshield, I extended the bow-deck length about 13 in.

Complete with 78 Mercury motor and



equipment, the boat weight is a little over 2,000 lbs. I have no trouble getting 30 mph with four people aboard and can cruise at 24 to 25 mph at $\frac{3}{4}$ throttle. With eight or nine aboard, have no difficulty putting boat up on plane, but would have to run wide-open to get about 25 mph. On a fishing trip was surprised to find I could idle that big Merc slow enough to troll.

Steering response is very good—many people won't believe it's a home-made boat.

416 E. Park Ave.
Arthur, Illinois

CHARLES VON LANKEN

Sure and what's wrong with a homemade boat? We'll lay you a bet the home builder takes as much (if not more) pride in the job he does than any commercial shipwright.

Heat Riser Specifics

Compliments on your general over-all improvement in the April issue. You get that little "extra something" of completeness into your how-to-do-it articles, such as your page

10,000 BARGAIN OFFERS

guaranteed within a year!

Get Such Eye Opening Buys as those listed below! Terrific

Buys in • CLOSEOUT • BANKRUPT • ODD LOT MERCHANDISE!

- \$5.50 Lucite Hairbrushes, 65¢ each!
- \$1 Automatic Card Shufflers, 9¢ each.
- 39¢ Under Arm Deodorant, 2¢ jar!
- 25 card asst. Xmas cards, 11¢ box!
- 50¢ Everyday greeting cards, 7½¢ box!
- \$200 Govt. Surplus Typewriters, \$23.
- \$1-\$3 Hard covered books, 20¢ each!
- 49¢ Xmas window decorations, 10¢ per set.
- Famous Brand \$18.75 Perfume, \$1.
- 69¢ Insect Repellent, 5¢ each.
- New Phono Records, 45 & 78 RPM, 7¢ each.
- CIGARETTE HOLDERS, 1¢ each.
- \$1 Kiddies Handbags, 3¢ each.
- \$1 Val. Billfolds, 15¢ each.
- \$2.50 Wallets, 30¢ each.
- D.E. Razor Blades, \$1.50 per 1000 blades.
- \$1 Mufflers, Scarfs, 12½¢ each.
- 25¢ Rudolph Reindeer brooches, 2¢ each.
- \$15 Electric Percolators, \$5 each!
- \$1 Chlorophyll Tablets, 7½¢ pkg.
- 15¢ Textile dyes, 3½¢ pkg.
- \$49.95 Gold Bracelet, Boxed \$4.75.
- POSTAL SCALES, 7½¢ each!
- \$2.98 Horseshoe game records, 30¢ each.
- \$1.95 Men's silk ties, 12½¢ each!
- PENCILS, 144 for 57½¢!
- 69¢ Insect Repellent, 5¢ each!
- CHRISTMAS SEALS, 25¢ per 1000!
- ENVELOPES, 50¢ per 1000!
- Calendar Wrist Watches, \$5.00 each!
- \$10 Men's Trolley Sets, 60¢ each!

(Above list merely illustrates type of Bargains found in this paper.
Lists change monthly.)

"BARGAINS" will MAKE or SAVE YOU Money!

Thousands are getting "Bargains" every month! It's the **only** big tabloid paper of its type published. "Bargains" brings you Bargain offers, THOUSANDS of them. Many are so rare, so terrific, that they're almost unbelievable! **WE GUARANTEE TO BRING YOU AT LEAST 10,000 BARGAIN OFFERS WITHIN A YEAR'S TIME!**

BUY CHEAP—SELL CHEAP

Today, more than ever before, people want Bargains! Everybody—but everybody is out looking for good buys. **You can literally "clean up" when you BUY CHEAP—SELL CHEAP.** Let "Bargains" help you do this. **EVERY MONTH!** You need "Bargains" now more than ever before! For "Bargains" shows you where to get tremendous, eye-opening bargains in—

TOYS, JEWELRY, BOOKS, HOUSEHOLD GOODS, APPLIANCES, FOODS, CLOTHING, GREETING CARDS, TOOLS, GIFTS, ETC. Often as low as 10¢ on the Retail dollar! Save Money! Buy at wholesale and even Below Wholesale all your requirements! Let "Bargains" show you how to do this every month of the year!

FREE with every subscription—"Buy Direct from the U. S. Gov't" (\$2 val.) Now you can get this valuable folio which shows you HOW

and WHERE to apply for gov't surplus merchandise and which sold for \$2.00 each, FREE with every 1 yr. subscription to "Bargains."

JUST \$2.00 BUYS "BARGAINS" for 1 FULL YEAR AND YOU GET THE FOLIO FREE! (Reg. \$4.00 value!) This offer is an experiment. We don't know how long we can keep it open! **RUSH YOUR SUBSCRIPTION NOW—Make sure of getting it in on time.**

LOOK WHAT SUBSCRIBERS ARE SAYING!

"... Your book BARGAINS is just wonderful and I am very glad I subscribed to it."—M.K., Port Monmouth, N. J.

"... As a result of answering one of the ads (in Bargains) it has resulted in extra profits of \$40.00 and upwards per month."—J. H., Alabama.

"... Saw your wonderful paper and enjoyed every bit of its reading and adv. It's a Great Paper!"—M. S., Vermont.

"... I think BARGAINS is the best merchandise publication I have ever seen (and I have seen hundreds)."—S. F. S., Brooklyn, N. Y.
PLUS MANY OTHERS!

Your Money Back IN FULL if the First Issue Doesn't Please You!

WHAT CAN YOU LOSE? If you are not delighted with your 1st issue, you can have your money back in FULL! No quibbling about it either!

"BARGAINS"

BOX 591-EB

LYNN, MASS.

BARGAINS

BOX 591-EB, LYNN, MASS.

Rush "Bargains" for 1 yr. and send Free a copy of "Buy Direct." \$2.00 enclosed. (\$2.50 Canada.)

Name _____

Address _____

City _____ State _____

ENGINEERING

HOME STUDY COURSES

Courses written by world authorities in all branches of engineering and science. Step-by-step instructions using methods proved successful by thousands of our graduates. One hour each day in your spare time will start you off to higher pay, security and prestige. Fill in the coupon to-day and indicate the course of interest. We will send you a complete outline of the course with a booklet describing the Institute and our advanced teaching methods.

CIVIL ENG.
SURVEYING
ARCHITECTURE
FORESTRY
STRUCTURAL
MECHANICAL ENG.
INDUSTRIAL ENG.
REFRIGERATION
DRAFTING
ELECTRICAL ENG.
RADIO
ELECTRONICS
TELEVISION
AERONAUTICAL ENG.
HIGH SCHOOL
CHEMICAL
MATHEMATICS
ACCOUNTING

MAIL THE COUPON TODAY

Canadian Institute of Science & Technology Ltd.,
751 Century Bldg., 412, 5th St. N.W., Wash., D.C.

NAME.....

ADDRESS.....

CITY.....STATE.....

COURSE OF INTEREST.....

Canadians: Send to C.I.S.T., 751 Garden Bldg.,
263 Adelaide St. W., Toronto, Ont.



C. I. S. T.

186 treatment of Spark Plug Troubleshooting. You gave detailed information on the gasket, which I have not seen in any other motor manual or article.

How about a similar well-detailed explanation of operation, servicing and replacement of thermostat springs of exhaust heat riser valves . . . ?

6943 N. Knox Ave.
Chicago 46, Ill.

P. J. McKENNA

We've dissected the heat riser valve fairly thoroughly in recent articles, P. J., but we'll take another look at our coverage to see if we come up with a better job.

Slowed by Straticarging

On page 84, April '60 S&M, it states that a straticarged 1956 Chrysler New Yorker goes from 0-60 mph in 12 seconds. This is compared to 10½ seconds for a conventional 1956 V8 Chrysler.

Is a straticarged car slower than one that is not straticarged?

1613 W. Albion
Chicago 26, Ill.

KEN GREENBERG

Yes. To get better fuel economy and smog-free operation, some acceleration has been sacrificed. Those of you who wanted to get in touch with inventor Ralph M. Heintz can write him at Box 546, Los Gatos, Calif.

Parts for Miniature Tape Recorder

I would like to express how much I enjoy reading your magazine—one of the few that still provides projects to build and helpful hints. Most of the others have turned into "what's new" and new car manuals.

Since I am a pilot I especially want to congratulate you on your well-written articles in test flying the new planes.

I have been searching for just such a project as your portable tape recorder blueprint (Apr. '60 S&M) ever since I saw the small tape recorders in Japan three years ago. But I did not feel I could afford \$140 for one. I am now in the process of obtaining the necessary parts for building the tape recorder. Not being learned in electronics I have encountered some problems in acquiring the necessary parts.

USAF

1/Lt. BILLY M. WASHAM

Box 4145, 1709TTS
Tinker AFB, Okla.

For those of you who have had trouble obtaining parts for the tape recorder, Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. and Newark Electric Co., 223 W. Madison St., Chicago 6, Ill. stock the electronic components. Thomson Industries, Inc., Manhasset, N. Y. make the Nyltiner bearings which are sold through local bearing supply houses. Wilson's of Cleveland, 6502 16th St.,



Save on everything in electronics

free

SEND FOR **ALLIED'S BARGAIN SUPPLEMENT**

SAVE MOST on Stereo hi-fi systems and components, stereo records and tapes. See best buys in exciting build-your-own KNIGHT-KITS®. Hundreds of special values in recorders, amateur gear, P.A. systems, test instruments, TV accessories, electronic parts, tubes and tools. Send for your **FREE** Allied Supplement packed with bargains and new electronic products. Save as never before!

ALLIED RADIO

FREE SUPPLEMENT

ALLIED RADIO, Dept. 65-H
100 N. Western Ave., Chicago 80, Ill.

☐ Send **FREE** Allied Supplement No. 195

Name.....

Address.....

City.....Zone.....State.....

FREE! STAMP FREAKS



To introduce you to the World's Largest Stamp Firm and America's Favorite Hobby — Four Spectacular Offers in One!

115 different, genuine foreign postage stamps:

1. One of World's Largest and Smallest stamps.
2. Fantastic collection of other stamp freaks — giants, midgets, weird designs, peculiar shapes, from strange remote corners of the world — Aden to Zanzibar!
3. Giant Collection of 100 all-diff. stamps from other exciting parts of the globe.
4. Big Bargain Catalog; Collector's Guide, other exciting stamp offers for your free inspection. Send 10c for mailing. **ACT NOW!**

H. E. HARRIS & CO., Dept. F304, Boston 17, Mass.

"No matter what YOUR AGE 15, 20, 30, 40, 50 if you **FREE! to YOU** ACT at Once

\$5 PICTURE-PACKED COURSES my to Make YOU a SUPER-MAN

"1001" Professional Secrets on How to GAIN or LOSE quickly up to 50 LBS. while you become

A NEW STREAMLINED ALL-MALE HE-MAN

says George F. Jowett

World's Greatest Builder of He-Men
World's Greatest Strength Champion.

As soon as you write me, I'll let you know
HOW to also get \$80 worth of apparatus, etc., **FREE**
Send a dime and your age to JOWETT INSTITUTE,
220 Fifth Avenue, (Dept. SM-08), New York 1, N. Y.

LAST CHANCE!



MASS PRODUCTION
MAKES THESE PRICES POSSIBLE
EASY TERMS
FREE COLOR CATALOG
TAFT MARINE WOODCRAFT
Dept. SM-860 636 39th Ave. N.E., Minneapolis 21, Minn.

18 FT. CRUISER KIT
WITH ONE-PIECE FIBERGLAS CABIN
ONLY \$520


LEARN PLASTICS



COMPLETE LOW COST SHOP METHOD HOME TRAINING NOW AVAILABLE

Get in on Big Money opportunities in Plastic molding, casting, forming, carving, etc. Earn as you learn with Interstate's professionally prepared course. All plastic materials furnished.

WRITE FOR FREE BOOKLET

INTERSTATE TRAINING SERVICE
DEPT. C-S, PORTLAND 12, OREGON

30 DAYS ONLY—Beginning with the next issue, your \$6M will be on sale for only 30 days. Be sure you buy your copy early at the newsstand—it may be gone if you wait. It will be at your newsstand August 30th—Watch for it.

Avoid Loss by Theft or Mistake!

Engrave Your Name on Metal, Wood, Plastic, Glass—
as easily as writing!

With New Handy Burgess Electric VIBRO-GRAVER You Can Permanently Identify Your Tools, Camera, Garden Equipment, Golf Clubs, Fishing Rods, Machinery, Car Hub Caps and Other Expensive Property By Engraving Your Name . . . In Seconds! Proven in Thousands of Garages, Shops, Etc. Pays For Itself Every Time You Use It!



ONLY **\$10.95**

COMPLETE WITH TANTALUM CARBIDE POINT

Used By America's Largest Corporations

Ford Motor Co.
Sperry Gyroscope Co.
Republic Steel
U. S. Steel
General Motors
American Airlines
Baldwin Piano Co.
Minnesota Mining Corp.
Fairbanks-Morse
American Chemical
Dupont
Railway Express

and many agencies of the Government including the Navy, Army and Air Force



America's largest corporations and thousands of individuals have proved Burgess Electric VIBRO-GRAVER in use on expensive machines, precious hand tools and in a hundred other ways. Amazing VIBRO-GRAVER will engrave anything—the hardest steel, glass, ceramic, stone, cast iron—anything! The secret is the unique vibration principle developed by Burgess engineers: unit actually delivers 7200 strokes a minute to the engraving point of fantastically hard tantalum carbide—which means that literally thousands of tiny dots form a solid line which is permanently engraved into any material.

SEND NO MONEY; TRY AT OUR RISK!

VIBRO-GRAVER is absolutely safe and so compact that you can work hour after hour without tiring. No skill needed . . . use it like a pencil. So easy and quick to use you can actually earn good money personalizing articles for friends and neighbors! Send no money; simply pay the postman \$10.95 plus C.O.D. and postage when unit arrives. Or, send payment now and we will ship postpaid. Use your unit for 10 full days; return if not completely satisfied for full refund! Mail coupon today.

JOHN N. FAIR CO., Grayslake, Illinois

JOHN N. FAIR CO., Dept. SM-8
Grayslake, Illinois

Yes, please rush my VIBRO-GRAVER, complete with tantalum carbide point. I understand that I may use it for 10 days, and if not completely satisfied I may return it for full refund.

VIBRO-GRAVER comes complete with instructions for permanently engraving all materials.

☐ I enclose \$10.95 payment ☐ Send C.O.D. I will pay in full. My unit will come C.O.D. charges and postage paid.

Name.....

Address.....

City..... Zone..... State.....

PROFIT from YOGA WISDOM!

Gain better health, more reserve vitality and a sharper, keener mind. Use YOGA, the science of body and mind control.



NEW POWER for SUCCESS!

From the first lesson you'll see improvements in yourself. *Insight School's Course* is simple, stimulating, effective! Results are startling, immediate!

No fads, fasts, diets, drugs. No expensive equipment to buy. All you do is study and practice a few minutes daily. YOGA training builds an enormous reservoir of will power and concentration... a new inner strength.

Prove it to yourself! Mail coupon for FREE trial Lesson I. Absolutely no obligation. No salesman will call. Just fill in and mail coupon TODAY!

**Start Your
All-Around
Improvement
TODAY!**

SEND COUPON

YOGA

INSIGHT SCHOOL

Dept. 250, 845 Chicago Ave.
Evanston, Ill.

Please send me YOGA Lesson No. 1 (No obligation.)
I enclose 25¢ for handling and mailing costs.

Name.....

Address.....

City.....Zone.....State.....



Everything You Need for UNDERWATER Sports and Adventure DIVERMASTER SKIN AND LUNG DIVING EQUIPMENT

Leading nationally known and foreign made products. Inspection tested at money saving prices. Underwater Breathing Apparatus, Swimming Masks and Fins, Diving Masks, Spear Guns, Water Suits, Diving Suits, etc. Send 50¢ for big illustrated Catalog.

(Dealer inquiries invited)

DIVERMASTER

Dept. 51-80

5677 W. 63rd Place, Chicago 38, Ill.



FREE ★ CLOGGED SEWERS REMEMBER THE COSTLY PLUMBING BILL

Chicago—July 1st. Just introduced is a Free Booklet on machines which enable the Home Owner, Janitor or Factory Maintenance Men to Rod-it-himself—YET, anyone can operate this new Rodding tool which is whirled down the drain in a few seconds. SINKS, BATHTUBS, TOILETS, URINALS, FLOOR DRAINS, HOUSE TO STREET SEWERS can be cleared of Hair, Grease, Paper, Sand while Cutter blades can be added for removing roots. A new discovery in Swedish Music Wire gives the rod 100% more flexibility.

Another new unit is the Miller Electric Rodder which has patented cutters that expand automatically to the size of the pipe. It will clean out heavy obstructions in pipe diameters 3" to 12". Smaller Sizes available. But now, what are these Tools worth in COSTLY PLUMBING BILLS SAVED. Over This Ad out—and write your name and address beside it for FREE BOOKLET on Hand and Electric Units. Over that urge. No Agent will fill. A postcard will do (Chicago Patent Kidder 5-1702).



Miller Sewer Rod, Dept. 51-8, 4640 N. Central, Chicago 30, Ill.

N. W., Fort Lauderdale, Fla. sells the Model 6-100 6-volt motor for around \$2.50 through the catalog, or directly through local toy and hobby shops.

As we write this, we have yet to receive that prize-winning first photo of a tape recorder built from our plans. So if you hurry, you may still win the \$25.

Well Ringer

In your April issue (Page 216) you have a picture of a cat and its private entrance (and



exit) from the house, built by R. S. Dart. He should have trained Tabby to ring a bell for this kind of service! Enclosed is photo of my pet.

R. D. 2

GEORGE M. WARD

Canandaigua, N. Y.

That's a well organized cat you have, George. But we still like Author Dart's solution for cats who keep late hours.

Fold-Up Trailer Queries

Would like to commend your staff on a very excellent April 1960 issue. The chord organ and camping trailer plans were especially interesting. However, I am curious to know how the trailer held together for 10,000 miles of vacation travel without springs.

316 S. Hamline Ave.

RICHARD K. PARR

St. Paul 5, Minn.

What is the weight of the fold-up vacation trailer (Apr. '60, S&M) completely built?

518 W. Mahoning St.

PETER J. SKOFF

Punxsutawney, Pa.

With the no spring-soft tire arrangement, would think the trailer would roll hard, causing the car to lug and upping gas consumption considerably. Don't the underinflated tires soon break down...?

R. D. 2

DAVID L. OSTRANDER

Jamestown, N. Y.

Author Troolin reports that his 1200-pound trailer has run 10,000 miles on two used 8-inch tires, and they still show little wear. Hauling the trailer reduced gas mileage by a not unreasonable 3.2 mpg. He has had no

Learn **ELECTRONICS** RADIO AND TELEVISION by Practicing at Home

YOU PRACTICE

with transistors and circuits similar to Industrial Electronic equipment. You build 4-frequency oscillator and check signal phase shift with oscilloscope.

YOU PRACTICE building working transmitter with CW and phone modulation. Experiment with "clamping" circuits, key filters and transmitter operation.

YOU PRACTICE

by building and testing Model W Vacuum Tube Voltmeter. Measure resistance, voltage. Test Electronic parts, tubes.

YOU PRACTICE

with UHF 400 megacycle oscillator. Duplicate transmission line procedure. Conduct numerous exciting experiments, build ground-plane, beam, Yagi and other type of commercial antenna systems.

SPECIAL TRAINING KITS FURNISHED —NO EXTRA CHARGE

YOU PRACTICE

with crystal diodes, neon indicators, capacitors. Experiment with telemetry used in industry and in satellites; practice with basic circuits used in digital and analog computers.

Fast Growing Use of Electronics in Rockets, Automation, Communications, Aviation, Transportation, Business, Television is Creating New, Interesting, High Paid Jobs.

NRI TRAINED MEN GET JOBS LIKE THESE

NRI is America's oldest and largest home study Electronic-Radio-Television school. There are thousands of successful NRI graduates throughout the United States and Canada earning high salaries, doing interesting and important work. **THOMAS FAVALORO** got a job in Electronics before completing his NRI course and is now quality control chief. **DONALD SMITH** enrolled while in high school, worked at the Guided Missile Test Center in Florida, now teaches Industrial Electronics. **DUANE BUTNER** says he really enjoys going to work as a technician on the Hawk Missile System. Free book tells what other graduates are doing and earning, what they say about Electronics and NRI. Mail coupon now.

Job counselors are recommending Electronics because they know the pay is high, jobs are interesting, advancement opportunities are great. Electronics is a multi-billion dollar industry now and experts predict it will double in a few years. This means big opportunity for the man with training and know-how for a career as an Electronic Technician.

Learn More to Earn More

NRI offers specialized training for the beginner, and for the experienced man, in Industrial and Military Electronics, Radio and Television Communications, Radio and Television Servicing. You train right at home in spare time. No previous experience needed. You don't need a high school diploma. Keep your job until you are ready for a better one.

Add to Your Income Soon

Soon after enrolling you can apply your knowledge and make extra money using radio and television sets, servicing other electronic devices, in your spare time. Thousands add to their income this way. Many build prosperous full time businesses from this beginning.

Find Out What NRI Offers

For 45 years NRI has been training ambitious men for success. The opportunity in Electronics is great. It is estimated that four to seven Electronic Technicians are needed for every Engineer. If you are unhappy with your present work, want better pay, a brighter future, mail the coupon. Remember, wishing won't solve your problem. You must act to get ahead. Don't put off. Free 64-page book tells about Electronic opportunities and how NRI will train you at home for them. Convenient monthly payments.

MAIL COUPON NOW

National Radio Institute
Washington 16, D. C. OHDA

Send me full information without cost or obligation. (Please Print. No salesman will call.)

Name.....Age.....

Address.....

City.....Zone.....State.....

ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL

STUDENT & LATEST HOME STUDY RADIO-TV SCHOOL
National Radio Institute
WASHINGTON 16, D. C. ESTABLISHED 1916

DRAFTSMEN



CASH BIG PAY CHECKS!

Train Now for
more success,
greater security

LEARN AT HOME IN SPARE TIME (or at college in Chicago)

Check the want ads in any newspaper—SEE the big-pay opportunities open to you as a draftsman. What's more, you can learn this well-paid, prestige profession at home—quickly, easily! No special talent needed! Get complete, step-by-step Chicago Tech lessons in the mail, spend a few pleasant hours studying each week. In a short time you'll be a well-trained draftsman, ready to take your pick of many good jobs. Act now!



Free Information—Mail Coupon Today!

Get FREE TRIAL LESSON plus information about C.T.C. practical training. Learn what successful Chicago Tech graduates say about high pay and opportunities in drafting. No charge, or obligation.

CHICAGO TECHNICAL COLLEGE

K-263 Tech Bldg., 2000 So. Michigan Ave.
Chicago 16, Illinois

Mail me FREE lesson with facts about big opportunities in DRAFTING.

Name..... Age.....

Address

City..... Zone.... State.....



DRAINS cellars, cisterns, wash tubs; \$7.95 IRRIGATES - CIRCULATES - SPRAYS

1,001 uses. Stainless shaft. Won't rust or clog! Use 1/8 HP motor or larger. 3/4 HP for up to 2,400 GPH; 450 GPH 80' high or 1800 GPH from 25' well. 1" inlet; 3/4" outlet. Coupling included free. \$7.95 HEAVY DUTY BALL-BEARING PUMP. Up to 5,200 GPH or 3,000 GPH from 25' well. 1 1/4" inlet; 1" outlet. \$12.95 Postpaid if cash with order. MONEY BACK GUARANTEED

LABAWCO PUMPS, Belle Mead 31, New Jersey

BE PREPARED!

FIX BROKEN DENTURES AT HOME IN MINUTES

Quik-Fix Denture Repair Kit

Easily mends broken plates; cracks; replaces loose teeth in minutes. Directions enclosed. Money back guarantee. Send \$1.98, enough for many repairs. QUIK-FIX COMPANY, Dept. QSM-9, 1075 Main St., Buffalo 9, N.Y.



BUY U. S. SAVINGS BONDS

trouble with the ground clearance (about the same as that on a modern car), but clearance can be easily increased by adding desired board thickness between axle and body. And springs can be added, though not needed, for those who don't mind the swaying.

Igniter and Injector Pro and Con

Was glad to see your article on the Fuel Igniter plugs (Aug. '59 S&M).

I placed a set of fuel igniter plugs in my Chevy 6 Two Ten at 21,300. Ran them without removing them till 36,750. They look like they had never been used—no soot and no ping on any gas used. . . . For me they are 100% better than regular plugs.

Gleneden Beach
Oregon

H. W. HOADLEY

. . . I purchased Fuel Igniters more than five months ago and upon installing them in my car (a 1954 Cadillac Coupe) I immediately detected a continuous miss both in low and medium speeds. Took the car to my mechanic to have same checked as to timing points etc. and he did so to factory specifications. The car continued missing and I returned them to the factory requesting my money back or a replacement with the plugs of my choice. After four and a half months I still haven't heard from the factory. . . .

U. S. Post Office

J. BLANCO

Oceanview Br.
Miami, Fla.

I bought a set of fuel igniters. Checked with compression, they fired better than AC's and a couple of other brands I tried. But that's as far as it went. Did not get any better mileage, vacuum reading, pick up or top speed.

5032 S. Seeley Ave.
Chicago, Illinois

MILTON C. RONCEK

. . . Have some fire injectors now but have not noticed appreciable difference in operation of car . . .

3111 Sixth Ave. DOUGLAS M. BLANKENSHIP
Tacoma 6, Wash.

For those of you who came in late, we reported in the Aug. '59 S&M on the results of tests which matched sets of conventional Champion spark plugs against a set of Fuel Igniters and a set of Fire Injectors. There was no appreciable improvement in fuel economy using the more expensive Igniters and Injectors. Since that time, we have been running a set of three Champion plugs and three Fuel Igniters in a 1951 Ford Six, alternating the plugs between cylinders every 500 miles. After 3,900 miles of driving, both types of plugs are running clean, with no visible signs of wear, and the car has started, idled and run well at all speeds with no indications of consistent mis-firing.

9 MAIL ORDER

SECRETS START YOU FAST TO BIG PROFITS AT HOME!



Would you like

to receive stacks of big cash mail everyday for running a little spare time mail order business right from your home? Thousands of "working people" from small towns, big cities and farms are quietly reaping millions of dollars each year for doing just that! This message shows you how you can start cashing in, too!

1 How to Start in MAIL ORDER at Home, Full or Spare Time!

Start small in spare time... no matter where you live. Build business gradually out of profits. Later, turn full-time to mail order.

2 How to Find Profitable MAIL ORDER Products!

More than 1,000 products that sell successfully by mail—plus ideas on thousands of others. Should completely solve your problem of what to sell.

3 How to Use "No Investment Drop Ship Plan" in MAIL ORDER!

List of manufacturers who ship orders directly to your customers, allowing you to pocket profits in advance. No inventory. No need to carry no stock.

4 How to Start in MAIL ORDER without Experience!...

No formal education or experience needed. You can put experience from past jobs, hobbies and interests to work, making bigger profits for you!

5 How to Get Free Membership in MAIL ORDER Exchange!

A world-wide fraternity of mail order people, founded to exchange ideas and promote success. Open to all people.

6 How to Triple Your Profits in MAIL ORDER!

Get repeat sales that make your profits skyrocket. You can expand indefinitely on sales to one group of customers!



7 How to Get Your Own MAIL ORDER Catalog

Get your own big profit catalog of successful products without dealing with "promoters" who sell standard catalogs to you at inflated prices.

8 How to Get FREE MAIL ORDER Ads!

Information that may be worth thousands of dollars. Long list of national magazines that give free space to qualifying products.

9 PLUS... HUNDREDS OF OTHER MONEY MAKING MAIL ORDER PLANS AND IDEAS!

"NINE SECRETS PLAN" Starts You Now

Men, women, families—new Mail Order Exchange "Nine Secrets Plan" helps you get a fast start to big profits in your own Mail Order Business. Reveals how and where you get best products to sell by mail. Shows you how to get free ads. Discloses how you can pocket the profits in advance, even before ordering merchandise or paying for advertising. Guides you step by step in starting your own profitable home mail order business now.

Confidential Bulletins • 14 FREE PRODUCTS

Following the Mail Order Exchange Plan, you receive 14 FREE samples of products that have sold successfully by mail. Also, you will receive confidential bulletins that put you in direct contact with known suppliers of products to sell by mail. You are shown how you can easily deal with these suppliers, how to get samples, how to make big savings on your own purchases. You learn the newest sure-fire mail order techniques as soon as they are discovered.

NO CAT'S PAW CATALOG Schemes

Mail Order Exchange is a NEW PLAN for making money. Not a blue sky "franchise," "package," or "catalog" deal where you buy and mail out catalogs containing standard products that are sold in department stores. Following our plan you get products direct from the original source—at the lowest possible price. The profits are all yours and yours alone! There is no franchise fee to pay. No charge for catalogs. No tedious study. You just follow simple proved step-by-step plans that have made fortunes for others who have used them.

Rush COUPON FOR FREE DETAILS

If you want to learn more about the nine secrets that may help you share the easy profits that come to successful mail order people, send at once without obligation for full details and your free copy of "How to Make Money in Mail Order." No salesman will call. Airmail reaches us overnight.

SEND FOR FREE PLAN TODAY! →



RUSH COUPON FOR FREE DETAILS

Mail Order Exchange Dept. C278B, 2717 Westwood, Los Angeles 24, Calif.
Rush FREE COPY of "How to Make Money in Mail Order" revealing proved "Nine Secrets Plan" for starting my own mail order business from home. I understand I may read and keep this Plan without any obligation whatever.

NAME _____

ADDRESS _____

CITY & ZONE _____ STATE _____

MAIL ORDER EXCHANGE
Dept. C278B, 2717 Westwood Blvd., Los Angeles 24, California

LEARN UPHOLSTERY

in your spare time

run your own business AT HOME



FREE TOOLS WITH COURSE

FREE BOOK

with sample lessons

WITH COURSE YOU MAKE



BE YOUR OWN BOSS

Earn more from the start! Set up your own profitable business. In your own home, enjoy steady income, independence for life in the booming field of Furniture Custom Upholstery. Right off, you start learning with tools, complete frames, fabrics and materials—ALL included FREE with your UTS course. Now the practical N.Y. State-approved UTS course is available to you right at home under the personal supervision of top notch upholsterers, the same fine professionals who teach in our N.Y. School. You learn skilled professional upholstery, reupholstery, furniture finishing, repairs, how to make beautiful slip-covers, window cornices, cushions and draperies, and quickly become a skilled craftsman. Best of All YOU EARN WHILE YOU LEARN, in your spare time—the UTS easy way. Many Upholstery Trades School students earn enough doing spare time upholstery to end their money worries. What they have done—YOU CAN DO!

SPECIAL OFFER

SEND ONLY \$1 FOR UPHOLSTERER'S PROFESSIONAL WEBBING TOOL

AND GET 4 Yds. Webbing FREE

FREE ILLUSTRATED BOOK WITH SAMPLE LESSON SHOWS YOU HOW!

Accept this FREE SAMPLE LESSON—With this lesson you'll be able to repair the bottoms of chairs, couches, webbed benches, stools, dozens of things! FREE DELUXE 36 page PICTURE BOOK (198 Illustrations) "UPHOLSTERY—Your New Way to a Successful Career." Tells you all about this expanding, big opportunity field... 17 ways to MAKE MONEY in upholstery! Get ready for a well-paid job, big profits, from steady work, as your own boss, running your own business. Training in N.Y. School also available. Accredited by N.H.S.C. Vet. Approved. Mail coupon NOW! No obligation. Upholstery Trades School, Dept. MM-817, 721 Broadway, N.Y. 3, N.Y.



Paul de Vita, former Auto Mechanic, says "Upholstery—my income—my own boss, thanks to UTS Training."

Send for FREE Illustrated Book

Upholstery Trades School
Dept. MM-817, 721 Broadway, N.Y. 3, NY
Please send me

- ☐ At no cost your big illus. FREE book with FREE sample lesson—no obligation, no salesman will call.
- ☐ I am enclosing \$1.00 for both your special upholsterer's webbing tool and 4 yds. of webbing (outside of U. S. please send 25¢ for additional postage).

Name _____ (Please print plainly)
Address _____
City _____ Zone _____ State _____
☐ Check if Korean Veteran.

FREE SAMPLE LESSON



PRINT YOUR OWN MONEY!



Not really, of course. Uncle Sam doesn't approve. We'll send you an amazing new printing invention (weighs less than 10 lbs.) that makes money so fast one user says, it's almost like printing \$20 bills!

Actually lets you turn out—on a small table in garage or corner of a bedroom—many printing jobs that are impossible on even a huge \$5000.00 press. **PRINT WITHOUT A PRINTING PRESS.** Yes, with equipment so simple we supply it FREE with Instructions, you can actually under-sell the biggest, most elaborate printing establishments on many types of printing—for theatres, gas stations, markets, stores, offices, etc., and just about every business within 100 miles. Screen-Print works on glass, metal, plastic, cloth, leather—anything at all—on curved surfaces as well as flat. **YOU, TOO CAN MAKE BIG MONEY AT HOME.** Cash in on this sensational new home-business development. No experience needed! Learn in a few hours! Some don't earn money, but some use spare time to earn up to \$15 an hour—\$100 or more a week. **WE SUPPLY EVERYTHING YOU NEED.** Complete instructions, Screen-Print equipment, enough supplies to start you making money almost immediately, can now be yours for only pennies! We guide and help you, supply step-by-step directions for building a profitable home business fast. Send for FREE details, samples and exciting Home Business plan. No obligation. Write TODAY SURE.

SCREEN PRINT CO. Dept. 48, 15127 S. BROADWAY, LOS ANGELES 6, CALIF.

LEARN TO MOUNT ANIMALS, FISH, PETS



Be a Taxidermist. Save your hunting trophies. Have your own business. Mount your own animal. DUCKS, QUAIL, DEER, TAN skins and FURS. Great Fun, Spare Time. **FREE BOOK** Tells ALL about it. 100 fine Send TODAY, don't delay. Get this WONDERFUL FREE BOOK, MEN AND BOYS. Learn Taxidermy. Double your business pleasure. Rush letter. POSTAL check. STATE AGENT. N.W. SCHOOL OF TAXIDERMIC, Dept. 2308, Omaha, Neb.

Draw CARTOONS



...for a wonderful pastime or excellent earnings. Master cartooning at home in a few short weeks without waste of time or effort through the Famous System of Manual Training. Send for Big, Illustrated Free Catalog

CONTINENTAL SCHOOLS, INC., Dept. D-7
4201 South Broadway, Los Angeles 37, California

"YOU ARE UNDER ARREST!"



Help Bring Crooks to Justice Through Scientific CRIME DETECTION! We have taught thousands this exciting, profitable, pleasant profession. Let us teach you in your own home. Learn Fingerprinting, Firearms Identification, Police Photography, Secret Service Methods thoroughly, quickly, at small cost. Over 800 of all American Bureau of Identification employ I.A.S. students or graduates. Write for FREE "How Book of Crime."

(A Correspondence School Since 1916)
INSTITUTE OF APPLIED SCIENCE, 1920 S. Main St., Dept. 644B, Chicago 48, Ill.

YOU CAN NOW LEARN DEEP SEA DIVING

STATE & VETERAN APPROVED CONSTRUCTION, EXPLORATION, UNDERWATER PHOTOGRAPHY • 7 Complete courses from SCUBA diving to deep sea diving • Expert instruction by Navy trained personnel • Available at our Miami academy or by correspondence • Send 25¢ for illustrated catalog and information.

DIVERS TRAINING ACADEMY, Dept. 660-2
9501 Old S. Dixie Hwy., Miami (Kendall) 56, Fla.

MONEY for MEN ALL DATA FREE

THE PLASTEX Industry needs manufacturers on small scale and for big production of lamp and Clock Stands, Art Goods and Novelties in Plastic and Marble. Experience unnecessary. The material makes regular 10¢ store sellers. Rubber moulds furnished for speed production. Small investment brings good returns. BIG WHOLESALE ORDERS NOW BEING PLACED. Ambitious men have chance for real prosperity. Our free booklet will interest and benefit you.

PLASTEX INDUSTRIES, Dept. B
3400 THIRD AVE., New York 56, N. Y.



The BIG FAT FLAME

by Harry Mayer

As told to him by

Colonel Fred P. Dollenberg

We were stuck in the busy mid-Manhattan street. Behind us the traffic piled bumper to bumper, horns screeching indignantly. The colonel leaned over to our cab driver. "What's wrong?" he asked.

The cabbie pointed with his cigarette to the car in front, "Look."

We did. The car ahead of us—a shiny 1959 model—had stalled and the starter clattered endlessly with that empty metallic sound that you know in advance is not going to make the motor catch. Twisting the ignition key in helpless fury, the unfortunate motorist at the same time was exchanging uncomplimentary opinions with the drivers of the vehicles snarled behind him. At length he piled out of the car, wrenched at the hood, and looked fiercely at the inert engine. To no one in particular, but as though to vindicate himself to his tormenters, he shouted: "I just know it's those damned spark plugs. Only two thousand miles and already they're shot!"

Startled, I turned to my companion. "Colonel," I demanded, "is this a plant?" He stared back at me, then he got it and he began to laugh. So did I, in a moment, and there we were in this taxicab, stalled between skyscrapers and going no place, roaring as though we'd never stop.

Spark plugs! That was the joke. The Colonel and I were on our way to his downtown office where I was scheduled to interview him for a magazine story. The subject—spark plugs.

You see, Col. Fred Dollenberg is the inventor and manufacturer of a device which is designed to allow automobiles to run **without** spark plugs!

Later, sitting in his top floor office, with the drapes parted to reveal the exciting lower Manhattan skyline, I got a more leisurely look at the Colonel. I wondered and asked about his smashed nose—the war maybe?—and he smiled and said no, just an opposing tackle with a very hard head. Dollenberg was a star fullback at St. Joseph's in Philadelphia before he joined the Army Air Force as a pilot immediately after he got his degree as an engineer. After war was declared against Japan and Germany, he saw enough action to later receive the Inquirer Hero Award as Philadelphia's most decorated flyer, succeeding a similar award to Marine hero Al (Pride of the Marines) Schmid. He was one of the first to personally pilot Gen. Douglas MacArthur. Evidently there was considerable brilliance to this young fighter; he started the climb up to the brain brass, and some of the military manuals he was charged with preparing are still used by the Air Force. (Only part of this

(Continued on next page)



"The spark plug was invented more than 40 years ago. For the last 20 years it has not been doing an adequate job. The U.S. Navy and Air Force knew this only too well. The Naval Bureau of Aeronautics cooperated with me by undertaking extensive, expensive testing to replace obsolete spark plugs with this new efficient type of fuel ignition. We were successful with the LS-702—the aircraft predecessor of the present Lectra Fuel Igniter for automobiles. Today this extraordinary invention is replacing spark plugs in tens of thousands of automobiles throughout the country. By 1961 every car made will carry fuel igniters not spark plugs" . . . Col. Fred P. Dollenberg, USAF Res., from a speech at the Conrad Hilton Hotel, Chicago, January 8, 1958.

did I drag out of Dollenberg. Indeed it was only through reading a newspaper file that I learned of the Colonel's outstanding combat record!)

It was while Dollenberg was in command of a task force of seasoned P-40 pilots that a grim incident took place which set the then Capt. Dollenberg off on his restless search for perfection. A young ace, coming in safe and sound from a mission where he had gone through murderous enemy fire, never made it to his safe hut a few hundred yards away. He nosed a bit too low — no engine power to get the plane up quickly — and the trees that lay just short of the runway caught the plane and pilot and crashed both. Dollenberg was horrified at the accident and at the paralysis of fatalism that seemed to settle on the shoulders of officers and enlisted men alike in the face of a tragedy so senseless. . . . After all, it seemed to say, it is true, isn't it, that more planes are lost through engine failure and other non-combat accidents than are brought down by the Japs? You had to expect such things — and accept them. . . . But Dollenberg couldn't accept it. Not when the cause of this type of accident could be ripped out of the engine.

"Plug failure?" I asked. He nodded, shortly. "This tragedy and others, too. Too many others. Did you know that spark plugs were invented more than 40 years ago for engines whose limit was 20 miles an hour? These very same spark plugs! And that in principle they haven't been changed an iota since? Can you imagine a 2000 horsepower motor depending for ignition on a skinny little spark that had been intended to help Grandpa toot around the square on a Sunday afternoon? Well, that's what these boys had under their P-40 hoods." The accident had started him off on his search, I supposed, and again he nodded. It hadn't been an easy journey. Apathy, defeatism—a young enthusiasm will always encounter these. I've done many success interviews, and it's a rare success that has been a joyride. Dollenberg spent long hours off duty working on the problem of the antiquated spark plug, but when the war ended he still hadn't cracked it. Returning to a young wife and family the Colonel organized a non-scheduled commercial airline and operated it for 3 million miles, even introducing gliders for the first time in commercial aviation.

If it hadn't been for some weight-throwing on the part of one of the larger airlines which had begun to smart under the irritating competition it was getting from the Dollenberg outfit, the young man would undoubtedly have succeeded in commercial aviation and this particular story wouldn't have been written. But as it was, Dollenberg was forced out of business on the sort of



technicality that somehow seems always to crop out against the small business, not the big. He had to sell.

Well, there he was — with a little money left from the debacle, a family, and a living to make for them. He turned his attention once more to the anachronism of modern engines — the spark plug. Starting again from scratch, he reviewed the problem.

"It's really quite simple," said Col. Dollenberg. "An engine provides power for a vehicle because gasoline, sprayed into the cylinder, is ignited by a spark. When ignited the gasoline burns pushing the piston down into the cylinder. The more complete the burning of the gas the more force in the cylinder. The more force, the more power. Obviously, therefore, the larger the spark the more gas ignited and burned. What we were after was a much larger spark, a **big, fat flame!**"

"And the conventional spark plug can't provide it?"

"No, it cannot. Every mechanic knows that."

"And the kid in the plane?"

"The P-40? What killed him was insufficient fire — a spark too skinny to ignite sufficient gas to give the engine instant power to climb up and over those trees."

"Why can't the spark plug give a fat spark?" I persisted.

The colonel spoke simply. "Because of its basic design. Every spark plug has an air gap — .025 to .035 of an inch — and the spark is no larger than the gap. No larger did I say? Only when the plugs are brand new is the spark even as large! Carbon forming immediately as the plug is put into use begins fouling, then ruining, the tip. The thin wire electrodes begin to wear away. The danger — and enormous expense — of this obsolete mechanism lies in these factors."

The answer to the spark plug was an igniter which had no airgap — which contained no wire electrodes — whose tip would not foul — which would not blow out even at the highest compression . . . which would never need a replacement for the life of the engine.

Colonel Dollenberg went to Washington.

The Navy didn't accept him with open arms. The principle — fine! Let's see it work. And Dollenberg made it work. After the most exhaustive tests, he knew he was in. . . . Out went the spark plugs. **His LS-702 Prototype was approved for U. S. Navy high-compression engine use.**

If that had been it, it still would have made a good story — the revolutionary change that a former fighter pilot had effected in military aircraft. But that wasn't all. Dollenberg turned to the field of automobiles.

For more than 40 years the old fashioned spark plug had been the standard gas igniter for every car made. During that time engine power had soared from less than 20 horse to more than 300. Every year the puny spark plug with its skinny little flame became less able to do its job. The new high compression engines were now burning out spark plugs in a few thousand miles of driving. In 1958 Americans paid more than 500 million dollars merely to replace wornout spark plugs. To provide what spark plugs could not do, the big oil companies began to produce super and then super-super gas — at super prices! Not only were car owners spending a huge sum for plugs each year — they were also spending a fortune in premium gas for the privilege of keeping spark plugs in their engines. And even at that they were not getting their money's worth, as the new cars they bought very soon became sluggish ones.

If ever there was a call for a modern, efficient ignition mechanism to go with the modern automobile, this was it. Dollenberg heard the call. He marketed the LECTRA FUEL IGNITER!

There were problems. Little ones like designing the Aircraft igniter to the same size and shape as the conventional automobile spark plug it was to replace. And big ones such as getting a small voice heard in the towering wilderness of the Detroit automobile kingdom. Dollenberg was helped by the shrewdness of fleet operators whose business depended upon efficiency and economy. Taxicabs running triple-shift around the clock installed the Fuel Igniter and reported a 10-20% increased gas mileage per car! Truck owners followed suit — and then the motorist. In less than 12 months, sales of the Lectra Fuel Igniter 'zoomed into the million dollar stratosphere!

I asked Dollenberg about the Lectra advertising claim that had jolted motorists all over the country. "Colonel, you've made the guarantee that LECTRA FUEL IGNITER will save a car owner \$100 a year or that you will take back the igniters and refund their money. How do you arrive at that one hundred dollars figure?"

"It's based on the average of 10,000 miles of driving in one year. First there will be a saving of from \$10 to \$12 a year in eliminating spark-plug cleaning, gapping, and adjusting at 5,000 miles, replacement at 10,000 miles."

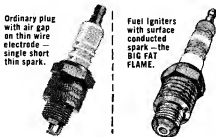
"Does that mean that the Fuel Igniter will need no cleaning or replacing for a whole year?"

"It means that the Fuel Igniter will **never** have to be cleaned or replaced! I mean that we guarantee that it will **outlast the life of any car!** Not only that: we are also guaranteeing that the Fuel Igniter will squeeze up to **6—maybe 8—more miles out of every gallon of gas purchased** the first year and every year—or we will replace them free until they do. That's a saving of \$40 per year. And it will do this using **regular gas**—economy gas—not the super gas bought at such walloping prices. That means a saving of \$50 each year. And the Igniters will do this every year of the car's life — they improve with age. **They never wear out!**"

As Dollenberg talked I drew up a chart. You can see it at the top of the next page.

I said to Dollenberg, "Colonel, to a person like myself—a guy who drives a car well but knows next to nothing about its mechanism — who's always felt the car runs better after it's had a wash — how will I know right away I've really got something after I've switched from spark plugs to Fuel Igniters?"

The Colonel twinkled at me in sympathy. "I've always felt it a pity they don't teach mechanics to all school children. I think I know just how you feel. Anyway — very seriously — please listen to this: The first time you press the starter after you've installed the Igniters (very simple — by the way), you'll hear and feel an instant clean throb and an immediate even roar of the engine. I tell you, you'll be astonished. Even on the coldest morning you'll get a thrill, listening to your engine kicking over instantly and then settling quickly into a smooth purr. As for stalling in traffic, like that fellow did this afternoon, that won't happen to you. Stalling is almost always traceable to a faulty spark—and the Igniter will not fault. Climbing and passing? Even a big



(Continued on next page)

(ADVERTISEMENT)
HOW MOTORISTS ARE SAVING \$100 A YEAR

	<u>SPARK PLUGS</u>	<u>LECTRA FUEL IGNITERS</u>	<u>SAVINGS</u>
Cleaning Gapping Replacing }	several times a year	never	\$10 per year
Gas Consumption	600 gallons	465 gallons	\$40 per year
Additional cost of premium gas	\$50 a year	not a cent	\$50 per year
		TOTAL SAVINGS =	\$100 per year

325 horsepower car can and does falter on a hill or when it tries to pass if suddenly the spark plugs aren't burning sufficient gas. That won't happen to you. Instead you'll climb and pass more swiftly than you've ever known because you'll be burning gas, not wasting it. You've heard about the simple exhaust test? Try it. First, with the spark plugs in place, let the engine idle and stuff a ball of white absorbent cotton into the mouth of the exhaust. It will come out soaking with **unused** gasoline. Then try it with Igniters replacing the plugs. The cotton ball will be almost dry. The gas **burned** instead of escaping through the exhaust. Or here's something else. Again with spark plugs in the car, go into gear—or in drive if you have an automatic transmission. Don't touch the accelerator. Now note how much the car moves forward—if at all. Then unscrew the plugs and replace the Igniters. If you stood still with spark plugs you'll move forward from 4 to 6 miles an hour with the Igniters while not touching the gas pedal! The gas that was required with spark plugs in your car merely to idle your motor without being able to move it forward, carries you forward up to six miles an hour with Igniters in the engine! One more final thing—with spark plugs a car must be looked over and adjusted several times a year. You know that from your own experience. But can you appreciate the concept of **never, never** having to remove or change spark plugs because you don't carry any? The concept of Fuel Igniters becoming **permanent** installations in your engine—for the life of your engine?

"Yet, with all this—believe it or not—I still haven't fully answered your question . . . How you'll use more air and less gas . . . the savings on your battery . . . increased RPM . . . how carbon—the enemy of spark plugs—actually increases the efficiency of Fuel Igniters. But what I've tried to say is that the spark plug is as inferior to the Fuel Igniter as the wagon is to the modern automobile. And just as out-dated. Auto mechanics know this now. The ordinary motorist is learning about it fast."

"One last question: What about Detroit, Col.

Dollenberg? Do you feel you're fighting a crusade?"

Dollenberg looked out of the window, out into the dusk of the city. There was a reflective quietness about him as he thought of his reply. Then he said: "No, we don't believe we're fighting the big spark plug manufacturers. Oh, there's bound to be a competitive fight soon because it's a matter of only a short time before these giants will all scrap their investments in the obsolete spark plug and turn to the manufacture of fuel igniters. Meanwhile—to put it quite candidly—there **is**, of course, that huge investment in stocks of spark plugs to liquidate and while the big fellows are attempting to unload, LECTRA will be booming along." The grin came out again as he said: "I hope they take their time about it. At the rate we're going we'll be big enough to take care of ourselves shortly."

I got up to go, convinced that Dollenberg's quiet confidence was well-founded. The product and the man were right for each other. Here's an incident which impressed me. A short time ago, LECTRA ran a mail order advertisement in the sober New York Times. One of the replies they got was from a gentleman in Pennsylvania who put it to LECTRA right on the line. Said the Pennsylvania man:

"I've read your ad in the New York Times. What I want you to do before I order a set is for you to send me a copy of that ad through the United States mails. Then if your Fuel Igniters won't come through with all those fancy promises—and if you don't send my money back if they don't perform as you say—I'll have Uncle Sam on my side while I go after you." The hard-bitten Pennman was sent the ad through the mails, all right. And he ordered a set of Fuel Igniters. LECTRA wasn't fearful that Uncle Sam would be after them. Because—and here was the kicker—**Uncle is a LECTRA customer!** Many military installations have field-tested the Fuel Igniter. As a result of these field tests, many thousand Fuel Igniters have been purchased by these government units.

So that's the story of The Big Fat Flame. I'm

(ADVERTISEMENT)

leaving a little space for a message from Col. Dollenberg. Meanwhile I'm on my way outside to

the garage with my set of Fuel Igniters. I can't wait to get rid of those spark plugs!

This article has been presented both as an advertisement for the Lectra Fuel Igniter and as a public service. Especially do I wish to emphasize the words **public service**. It is flattering to be imitated, it is said, but since the invention of the Lectra Fuel Igniter, there have appeared so-called "imitations" which have failed to perform as promised.

We state, flatly and sincerely, that we can back every claim that appears in Mr. Mayer's story. Please look very carefully at the table which follows: The fuel consumption figures in this chart are compiled from extensive field tests by industrial and private users.

RECORD OF PERFORMANCE — LECTRA FUEL IGNITERS**NOTE — All Lectra-equipped cars in these tests used REGULAR GAS**

(compiled from survey reports and field tests)

YEAR	Make of Car	Spark Plug Miles Per Gallon	Lectra Fuel Igniters Miles Per Gallon	Miles increase	(Gain) Extra Miles Per Gallon
1956	Chevrolet V8	17.7	22.2	24%	4.5
1959	Oldsmobile	17.1	20.3	18.7%	3.2
1955	Nash Rambler	20.0	27.6	38%	7.6
1954	Plymouth 6	22.2	26.0	17%	3.8
1955	Ford Fairlane	14.0	21.2	50%	7.2
1957	Chrysler Windsor	16.5	21.0	20%	3.5
1954	Oldsmobile 98	15.5	18.0	14%	2.5
1958	Pontiac	15.6	19.1	22.4%	3.5
1957	Dodge D-500	16.0	21.5	35%	5.5
1951	Buick Super	13.0	17.0	22%	4.0
1958	Chevrolet	16.9	23.8	40.8%	6.9
1956	Plymouth V8	16.0	20.0	25%	4.0
1955	Oldsmobile 98 (air-conditioned)	15.0	20.9	40%	6.0

All above figures confirmed by letters and reports available from our files in New York City.

Nothing is as exacting — as compromising — as cold statistics. In the final analysis, nothing will prove to you the extraordinary benefits of the Lectra Fuel Igniter as its performance in your own automobile.

Therefore we guarantee (and stake our reputation and our business on this guarantee): **That Lectra Fuel Igniters must be everything we say they are, everything we have led you to expect. They must make your car perform as you never thought it would and on regular gas. You must in YOUR OWN JUDGMENT get easier starting, faster pick-up, improved economy (to conform to the table above) or you can return them within 10 days and get back every cent you paid — without question and without delay. What's more — they must continue to function properly for the life of your car or they will be replaced until they do.**

We've taken a lot of your time in presenting our story. Now there's nothing else to say; the rest is up to our Fuel Igniter. If you want to try them (bear in mind our guarantee) they will be rushed to you as soon as we receive your order. For your convenience we are adding a coupon to the bottom of this page. If you'll fill it out and mail it I can promise you the most exciting automobile experience you've ever known.

Sincerely,



Lectra Fuel Igniter Co.

Lectra Fuel Igniter Co., Dept. M-4
11 East 47 Street, New York 17, N. Y.

Rush my Lectra Igniters by return mail on your money-back guarantee.

☐ I enclose \$12.60 for 6 Igniters

☐ I enclose \$16.80 for 8 Igniters

☐ I enclose \$.....for.....Igniters at \$2.10 each

☐ Send.....Igniters C.O.D. I enclose \$1 deposit and will pay postman balance on delivery plus shipping charges.

My car is.....year.....make.....model.....no. of cylinders

Name.....

Address.....

City.....Zone.....State.....



Use Your Outboard as a Pump

• In less than five minutes you can attach the *Shellback* pump to your outboard and be able to pump water at 110 gal./min. at 55 lbs. pressure. The 8½ lb. pump is made of cast aluminum and bronze and consists of just five parts. To attach remove the outboard prop, slip the pump over the shaft and tighten to housing. Fits any outboard of five or more hp. Price, \$49.50. Manufacturer, *Shellback Mfg. Co.*, Dept. RCS, 1320 E. Elza, Hasel Park, Michigan.

Scuff Plate-Threshold Set

• Ease of installation and maintenance are claimed for the aluminum scuff plate and threshold shown below. The guard being pointed out by the pencil is fitted with a vinyl tube for a tight seal along the full width of the door. Guard can be installed on either side of the door. Product is available in mill finish (\$6.49 for 32 in. width and \$6.98 for 36 in. width), polished, satin or gold anodized finish at somewhat higher prices. Available from *Skuff Guard, Inc.*, Dept. TYG, 3232 N. W. 38th St., Miami 42, Fla.



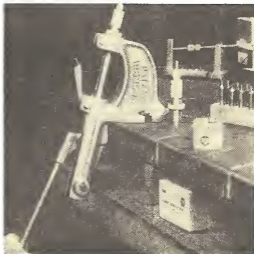
Rechargeable Radio Battery



• A rechargeable battery and plug-in charger interchangeable with the miniature 9-volt batteries used in transistor radios is said to be good for thousands of hours of life. To recharge, just snap the battery into the charger and plug into an a-c outlet. The *Pony*, as the unit is called, is a Japanese import tagged at \$4.95 by the *B&K Mfg. Co.*, 1801 W. Belle Plaine Ave., Chicago 13, Ill.

Up- or Downstroke Action on Reloading Tool

• Reloaders can now specify their choice of a downstroke or upstroke handle operation when selecting the *Pacific Super* tool (\$18.50). Several operating advantages are claimed for the downstroke method. By starting the stroke from a waist-high, horizontal position,



I EARN BIG PAY and I WORK EVERY DAY!

Train at Home for a Better Job in AUTOMOTIVE MECHANICS

There's a bright future just ahead for you. The auto industry is short 100,000 mechanics. It also needs 25,000 new repair shops. You can enjoy steady work, high wages—or even a business of your own—if you are a *trained man*. Don't let the "if" stand in your way! It's easy to get training.

CTI has a fine, new Home Study course that is very practical, up-to-date and easy to understand. It includes tools and instruments. Before you know it, you'll be working on your own auto, then on other cars—for pay. Perhaps in the local garage, while still a student. *Get more information* on these wonderful job opportunities in America's No. 1 industry. *Mail coupon today.* We'll send our new catalog.

YOU PRACTICE—YOU GET EXPERIENCE— USING ENGINE TUNE-UP KIT AND TOOLS

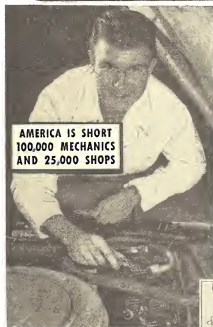
YOU DO NOT PAY EXTRA FOR THESE FINE KITS

No extra charge for tools and tune-up kit. All are yours to use and keep.



CTI tools and instruments are professional in design and quality—the kind that experienced mechanics use to do good work faster. You get all necessary mechanic's tools, including socket set, and a tune-up kit which includes: Compression Tester; Vacuum Gauge & Fuel Pump Tester; Ignition Timing Light;

and portable, steel case. Using tools and instruments gives you confidence, makes you proud of your craft, speeds up training, and best of all, lets you *learn by practicing*. Yes, you acquire experience as you train. No need to spend years as a low-pay apprentice! You practically get on-the-job training in your own home.



AMERICA IS SHORT
100,000 MECHANICS
AND 25,000 SHOPS

Many CTI Students Make Money Soon After They Start Training

CTI trains you to become an all-around mechanic. You learn tune-up and overhaul; electric, cooling and lubricating systems; power steering and brakes; automatic transmissions; etc. Many students, however, start fixing cars soon after they enroll. They work part time "on their own", or in local shops. They add to their incomes, earn enough to pay tuition, and buy shop equipment. Some have a brisk business under way by graduation time. *Our catalog gives you information on how to earn as you learn.*

FIRST GET THE FACTS—THEN DECIDE Mail Coupon Today for 2 Free Booklets

DIESEL MECHANICS OR BODY-FENDER REBUILDING instruction is included with your training—at no extra cost. Only Commercial Trades Institute gives you this added choice.



• This is the home of CTI, one of the world's great home study institutions. CTI offers training you can trust—all the advantages of a seasoned, proven training program.

COMMERCIAL TRADES INSTITUTE
CHICAGO 26, ILLINOIS

COMMERCIAL TRADES INSTITUTE

1400 GREENLEAF AVENUE
CHICAGO 26, ILLINOIS

DEPT. A-1299

Mail me your two opportunity booklets: *Make Big Money in Auto Mechanics*; and *Sample Lesson*. Both are FREE.

Name _____ Age _____

Address _____

City _____ Zone _____ State _____



the reloader has an unobstructed view of his work and can apply maximum pressure throughout the arm motion without stopping to change grips. The handle also locks in this starting position to maintain the shell-holder in correct position for receiving a case. A slight forward push releases it for the downstroke. Present owners of Pacific Super or Standard models with a straight-link design feature can convert their upstroke units by purchasing only the new downstroke assembly component (\$6.75). Made by Pacific Gun Sight Co., Inc., Dept. SAA, 2901 El Camino Real, Palo Alto, Calif., the units are available from gun dealers.

World Globe for Hams and Swls

• Features of this 12-in. full color globe for hams and shortwave listeners are devices which indicate to the user the direction in degrees and the distance of any country from his own location. The directional disc is calibrated from 0 to 360° and the mileage strip from 0 to 12,500 miles in 500-mile segments. When the mileage strip is moved to the country desired, distance and direction in degrees are indicated simultaneously. A pivot post for these indicators permits customizing the globe for any location, while a swivel mount permits rotating the globe in either the polar or equatorial plane.



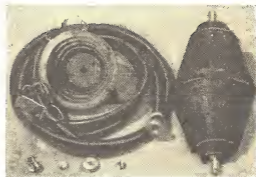
Amateur call letter prefixes are shown on each country. Also included in the \$11.95 price is a disc which indicates the time anywhere in the world. Carried as 77 S 325 by Allied Radio Corp., Dept. CN, 100 No. Western Ave., Chicago 80, Ill.

A Handful of Air Pressure

• The Auto Doctor (\$3.98) will blow out clogged gas and oil lines, inflate tires to 12 lbs. for emergency drive-ins, bleed hydraulic brakes, dry distributor, siphon gas from one tank to another, pressurize tank for overcoming vapor lock. Or, using only part of the Auto Doctor (or purchasing separately under the name of Squeeze-Aire at \$2.98) the device can be used to inflate basketballs, air mattresses, bicycle tires, auto tires up to 15 lbs., or pump liquids from one container to another.

Those who need only the features of the universal cup portion of the Auto Doctor, can purchase the Auto Doctor, Jr. (\$1.29) which consists of a cup, 24 in. of Buna N tub-

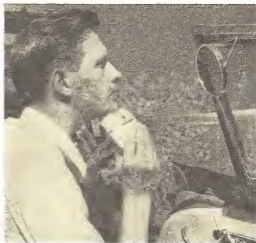
ing, valve and shut off clip. With it you can pressurize the fuel tank by blowing on the tubing with the mouth, thus generating enough pressure to force fuel into the carbu-



retor, overcoming vapor lock and air lock and permit driving with an inoperative fuel pump. Available from General Specialties Co., Dept. P. O. Box 539, Glenwood Springs, Colo.

Cordless Shaver Has Recharger

• The Remington Lektronic full-sized, cordless electric shaver is rechargeable and completely adjustable to any beard or skin. Two nickel cadmium batteries provide the power, storing enough energy for more than a week's shaving. An overnight stay in the re-



charging stand plugged into any 90- to 250-volt AC outlet replenishes the energy.

The gold and white unit is packed with charging unit, cord and brushes in a fitted black and gray leatherette gift case. Retailing at about \$40, the shavers are available nationally or by mail from Hoffritz, Dept. RAM, 49 East 34th St., New York, New York.



Don Bolander says: "Now you can learn to speak and write like a college graduate."

Is Your English Holding You Back?

DURING a recent interview, Don Bolander, director of Career Institute of Chicago and a leading authority on adult education, said, "You don't have to go back to school in order to speak and write like a college graduate. You can gain the ability quickly and easily in the privacy of your own home through the Career Institute Method." In his answers to the following questions, Bolander tells how it can be done.

Question: *What is so important about a person's ability to speak and write?*

Answer: People judge you by the way you speak and write. Poor English weakens your self-confidence—handicaps you in your dealings with other people. Good English is absolutely necessary for getting ahead in business and social life. You can't win the respect and complete confidence of other persons without a sure command of good English.

Question: *What do you mean by a "command of English"?*

Answer: A command of English means you can express yourself clearly and easily without fear of embarrassment or making mistakes. It means you can write well, carry on a good conversation—also read rapidly and remember what you read. Good English can help you throw off self-doubts that may be holding you back.

Question: *But isn't it necessary for a person to go to school in order to gain a command of good English?*

Answer: No, not any more. You can gain the ability to speak and write like a college graduate right in your own home—in only a few minutes each day.

Question: *Is this something new?*

Answer: Career Institute of Chicago has been helping people for many years. The Career Institute Method quickly shows you how to stop making embarrassing mistakes, enlarge your vocabulary, develop your writing ability, discover the "secrets" of interesting conversation.

Question: *Does it really work?*

Answer: Yes, beyond question. In my files there are thousands of letters, case histories and testimonials from people who have used the Career Institute Method to achieve amazing success in their business lives.

Question: *Who are some of these people?*

Answer: Almost anyone you can think of. The Career Institute Method is used by men and women of all ages. Some have attended college, others high school, and others only grade school. The method is used by business men and women, typists and secretaries, teachers,

industrial workers, clerks, ministers, and public speakers, housewives, sales people, accountants, foremen, writers, foreign-born citizens, government and military personnel, retired people, and many others.

Question: *How long does it take for a person to gain the ability to speak and write like a college graduate, using the Career Institute Method?*

Answer: In some cases people take only a few weeks to gain a command of good English. Others take longer. It is up to you to set your own pace. In as little time as 15 minutes a day, you will see quick results.

Question: *How may a person find out more about the Career Institute Method?*

Answer: I will gladly mail a free 32-page booklet to anyone who is interested.

If you would like a free copy of the 32-page booklet, "How to GAIN A COMMAND OF GOOD ENGLISH," just mail the coupon below. The booklet explains how the Career Institute Method works and how you can gain the ability to speak and write like a college graduate quickly and enjoyably at home.

DON BOLANDER

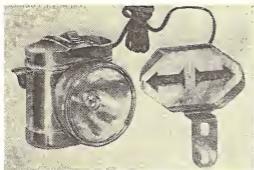
Career Institute, Dept. E-1239, 30 East Adams, Chicago 3, Ill.

Please mail me a free copy of your 32-page booklet.

NAME _____
STREET _____
CITY _____ ZONE _____ STATE _____

Directional Signals for Bikes

- For just \$2.25 you can add a headlight-turn signal unit to your bike. The battery container-headlight mounts on the handlebars



while the directional signal screws into place on the back of the bike. Made by L & M Co., Box 881-SIR, St. Louis, Mo.

Baffled Sprinkler and Soaker

- By raising or lowering one or more of the lily petal baffles in this sprinkler, you can design just about any spray pattern needed, full circle to 30 ft. or a narrow swath. Serrated spreader head breaks the water into fine spray.



Made of rust-proof metals and enameled in two colors, the sprinkler is priced at \$3.95 by W. R. Steele Co., Dept. SM, 7569 University Ave., La Mesa, Calif.

Variable-Pitch Prop Halves Trolling Speed

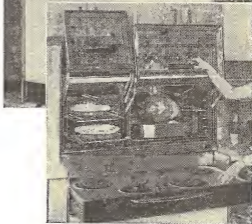
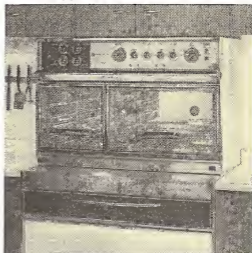


- Slow trolling is possible with the new models of the Multi-Pitch propeller, said to give a 9-14 or 10-15 in. pitch range, depending on the type of motor. Low pitch gives the boatman a blade angle setting for maximum power while a high pitch gives greater speed or economy in cruising.

While the new props, designed to fit almost all models of 24 to 45 hp outboard

motors are said to have six pitches in addition to the new trolling pitch, the selector dial can be set to any desired position. Only a screwdriver is needed in replacing damaged blades. Prices range from \$27.75 to \$32.50, depending on the motor used. Made by Lesnor-Maehr Marine Co., Inc., Dept. GBA, Floral Park, New York.

Free-Standing Ranges with Appearance of Built-ins



- New free-standing electric ranges which have a built-in look, yet are available either as ranges alone or with base cabinets have been announced by Frigidaire. The *Flair* model illustrated consists of a two-oven-plus-four-burner unit (\$560) on a companion cabinet (\$60). Because the oven doors move upward, they do not interfere with utensils on the range. Range itself acts as a drawer in that it fits completely into the cabinet when not in use and rolls partly out for two-burner use or all the way for four-burners.

FLORIDA'S "HIGHLANDS OF PARADISE"

Every week over 3,000 new residents move into Florida to live. And no wonder! No state income tax, no inheritance tax (prohibited by the State Constitution). Virtually no real estate taxes because the first \$5,000 of assessed valuation (usually much lower than the actual value of your home) is exempted from taxation.

And all this in a paradise where a couple can live comfortably on a moderate income. Comfortably? What an understatement when you are talking about the only sub-tropical state in the Union with its waving palms, its sun-kissed climate, its gorgeous foliage, its sparkling waters. Florida is a state so rich in all gifts, so lavishly endowed by Nature, with such a spectacular present and so breath-taking a future that living here is pleasure—pure pleasure! No wonder every week someone you know or have heard of is moving to Florida for good—to really LIVE!

But is there a catch? Yes there can be. To many people Florida means its coasts—its Miami, its St. Petersburg, its Daytona, its Jacksonville. And the cost of land there is high—very high. Buidling lots usually sell for thousands of dollars each in these areas—many times even higher. And the irony is that coastal sections are often a headache to the buyer. In the words of W. M. Gracy, District Manager of Florida Power Corp. and President of Dunnellon Chamber of Commerce: "...the most important factor in choosing a homesite in Florida is the selection of high, dry, well-drained land. Much of the state, particularly in coastal areas, consists of low lying or filled lands which often present a permanent drainage problem to homeowners."

"High and dry land"—that is the secret of Central Florida—the high lands of Paradise! The rate of growth in Central Florida is about 15% ahead of the rest of the state! And why shouldn't it be? Central Florida is more beautiful, yet costs much, much less. Nature is no where else as extravagant in her blessings. Water? Central Florida has 3000 beautiful lakes! Natural beauty? The exotic foliage, balmy climate, rolling hills, can't be equalled by anything on the flat coast-land. Fertility? This is the orange tree country.

And best of all it is high land—beautiful rolling hills whose elevation averages between 75 ft. and 115 ft. above sea level!

We are the developers of **Rainbow Lakes Estates**, situated in the Ocala-Dunnellon-Silver Springs area, the heart of the highlands of Paradise. We are blessed with 3 sandy-bottomed lakes—deep, blue-watered and with our own



private beaches. Fishing! Here is the banner that greets you when you drive into Dunnellon.



Our lovely private Country Club is nearing completion and you automatically become a member with full privileges when you purchase a homesite in **Rainbow Lakes Estates**.

Now please read this: **Every homesite in Rainbow Lakes Estates is on rolling land and we guarantee that you will NEVER HAVE A DRAINAGE PROBLEM!** We say it once more! Every homesite is high, dry and fertile with never a wet spot, and with never a drainage problem. And all you have to do to convince yourself that **Rainbow Lakes Estates** is really the highlands is to inquire of any bank or Chamber of Commerce in the Ocala-Dunnellon-Silver Springs area.

The price of our lots? We guarantee our homesite owners gracious living. We won't permit overcrowding. Therefore we sell our homesites in parcels of 1/4 acre minimum, \$595 for the full 1/4 acre! This is it—no extras, no assessments, no fine print! Terms? \$10 down, \$10 per month!

But you'll want to know more—much more, about our hard-paved roads under construction, our neighbors, our low humidity, utilities, thousands of things. And we'll be delighted to tell you the full, thrilling story—**ABSOLUTELY FREE AND WITH NO OBLIGATION**—in our fascinating portfolio in full color. We repeat: we're anxious to do this FREE and with no obligation to you—merely for your asking. If you're thinking of Florida at all, you owe it to yourself to read the story of the "Highlands of Paradise." Just drop us a post-card or letter. We'll rush you your free portfolio. That's all. There will be no callers, no salesmen. Send your name and address to **RAINBOW LAKES ESTATES, Dept. RA-4, 819 Silver Springs Blvd., Ocala, Florida. AD59072(4)**

"THEY TOOK ME FOR A RUSSIAN!"

Says Linguaphone Student in Moscow



William Henry Garvin mastered Russian right at home

QUICKLY SPEAK Spanish, French, German ...any of 34 World Languages by New RELAXED WAY at Home

Think how useful and exciting it is to speak another language like a native. Think of being at home anywhere — of ordering in the finest foreign restaurants here and abroad — of conversing in any of 34 world languages. The new RELAXED scientific shortcut — Linguaphone — makes it easy! Almost overnight you can start speaking like a native in Spanish, French, Italian, Russian, etc. — Right AT HOME without any effort at all.

34 Languages by Linguaphone on FREE TRIAL.
Write for details. Send for FREE Book Today.

LINGUAPHONE INSTITUTE		Please check your language interest:
Dept. R-28-280, Radio City, N. Y. 20		
Please send me: <input type="checkbox"/> FREE Book, "Your Passport to Languages."		<input type="checkbox"/> Spanish (American)
<input type="checkbox"/> Details of FREE TRIAL — no obligation		<input type="checkbox"/> Spanish (European)
Name _____		<input type="checkbox"/> French
Address _____		<input type="checkbox"/> German
City _____ Zone _____ State _____		<input type="checkbox"/> Modern Greek
		<input type="checkbox"/> Italian
		<input type="checkbox"/> Russian
		<input type="checkbox"/> Japanese
		Other _____

**MONEY-BACK
GUARANTEE**

\$1.25
POSTPAID



You shoot straighter and harder
with this novel and—

Powerful Slingshot

It drives low-cost BB's through 100 paces of this magazine. Amazing power and accuracy for targets; pests; hunting; etc. Scientifically designed for high muzzle velocity with easy (8-lb.) pull. Gravity-centering power cone. 100% operating safety. Small. Wt.— $\frac{3}{4}$ oz. Foolproof. Extra power cone, sample ammo, instructions included. Send today. Dept. X Alico, 3912 Wyandotte St., Kansas City, Missouri.

C2

**You Can Be a
Manufacturer
of Gardencrete**

Set of 18 Flagstones (below). Sells for \$8.95. Costs to make, \$3.00. Your markup, \$5.95.

Your spare-time manufacture of Gardencrete can lead to a full-time business, with broad sales potentials and generous income possibilities. A small investment buys the Colorglazing machine and a few molds. Add more molds as your business continues to expand.

Gardencrete has wide sales appeal wherever people have pride of lawn and garden. Colors are fused on under air pressure. Stay put for years and years. Choice of 30 colors.

Your mark-up on basic costs is 200%—300%. Products easily made in shed or garage. We supply full instructions. Write for literature and information on costs and selling prices on complete line.

Colorcrete Industries, Inc.
721 OHawa Ave., Holland, Mich.



Bird Baths
Jars and Vases
Flower Boxes
Flagstones
Lawn Seats



TV Kaleidoscope

• Your youngsters may not be enjoying the formal type of color TV, but the TV Kaleidoscope will provide them with many different beautiful color designs.

To use the 'scope, just turn on the TV—any



channel or blank screen, hold the wheel at arm's length and spin the head. The \$1.50 toy comes with four interchangeable color discs to provide variety. Made by the Whirley Corp., Dept., LEW, 153 No. Meramec, St. Louis 5, Mo.

Shoulder Strap Clip

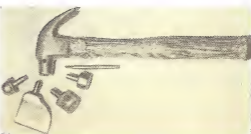
• Photos and others who transport their gear via shoulder straps will find the Carri pin will keep the slipping straps in place.



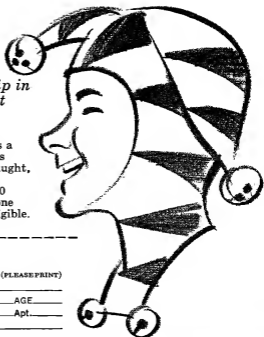
Just $1\frac{1}{4}$ in. long, the pin clips on the shoulder in such a way that its pins lock in place. It is put on or removed with one motion of the hand. Available in chrome or gold finish at \$1 from Carri Pin, Inc., Box 274-AA, Massapequa, New York.

Three-in-One Hammer

• This 16-oz. claw hammer (\$4.95) comes with a nail head for regular carpentry, ballpeen for sheet metal, soft head for finish work and a knockout pin. A hatchet head



draw the Jester



CONTEST PRIZE: \$495.00 Scholarship in Commercial Art

Draw the Jester any size except like a tracing. Use pencil. Everyone who enters contest gets an estimate of his talent. Winner receives a complete course in commercial art from world's largest home study art school. Students are taught, individually, by professional artists. Try for this free art course! Entries for September 1960 contest must be received by September 30. None returned. Amateurs only. Our students not eligible. Winner notified. Mail your drawing today.

Art Instruction, Inc., STUDIO 8270-1
500 South 4th St., Minneapolis 15, Minnesota

Please enter my drawing in your draw-a-head contest. (PLEASE PRINT)

Name _____
Occupation _____ AGE _____
Address _____ Apt. _____
City _____ Zone _____ County _____
State _____

LEARN MEAT CUTTING AT NATIONAL Pay After Graduation

The steady dependable trade of Meat Cutting taught easily in 8 short weeks. **YOU LEARN BY DOING** under actual meat market conditions in big modern school at Toledo.

For beginners or men with experience. Get a profitable store of your own. Remember, **PEOPLE MUST EAT!** Big pay jobs. Free employment help. Thousands of successful graduates.

Buying, cutting, percentage, pricing, advertising, selling, etc. A complete retail meat education. National School established 37 years. Get National training NOW. Pay your tuition in easy monthly payments after you graduate. Send coupon for FREE 40-page school catalog — TODAY. G.I. approved.

National School of Meat Cutting, Inc., Dept. 53-Y, Toledo 4, Ohio

Send me your FREE school catalog on National Training at Toledo in Meat Cutting, Meat Merchandising and Self-service Meats. No obligation. No salesman will call.

Name _____ Age _____

Address _____

City _____ State _____

Approved for Veterans

LAW FREE BOOK THE LAW TRAINED MAN

Write today for a FREE copy of illustrated law book, "THE LAW-TRAINED MAN," which shows how to earn the professional Bachelor of Laws (B.L.B.) degree through home study of the famous Blackstone Law Course. All necessary books and lessons provided. Modern, convenient monthly terms. Write for FREE law training book today.

Blackstone School of Law, 307 N. Michigan Ave.
Founded 1890 Dept. 80C, Chicago 1, Ill.

Take Up Slack Time—Make Extra Money FIX SMALL AIR COOLED ENGINES New 4th Edition available—Contains 387 Makes & Models

Complete information on maintenance, servicing and repairing gas engines used on Chain Saws, Lawn Mowers and Go Karts. Edited by engineers and professional mechanics. Information on 24 major manufacturers engines. 2 New sections added—American Marc and Homelite. 387 Makes and Models in all including Lauson, Power Products, Briggs & Stratton, Clinton, Cushman etc. 121 New engine models added with total of 387 models listed. 525 maximo and 447 carburetor models listed. 320 pages of practical down-to-earth information on 2 and 4 cycle engines, 1, 2 and 4 cylinder models. Central parts distributors listed. Authoritative section on gas engine fundamentals. Trouble shooting and servicing of ignition and carburetor equipment. Section on trouble shooting for beginners. \$4.95 postpaid. Satisfaction guaranteed or your money back. Send check or money order. Order now. Clip this ad.

Small Engines Service Manual, Dept. 1360
1014 Wyandotte, Kansas City 5, Missouri

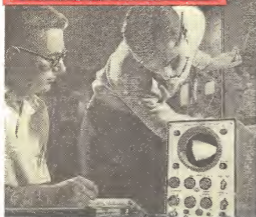
MAKE MONEY!
REPAIR HYDRAULIC JACKS

Earn While You Learn At Home
Make up to \$5 an hour, full or part-time, in the competitive-free field of Hydraulic Jack Repair. Millions of jacks in auto service stations, truckers, body shops, riggers, farms, need servicing. We show you HOW. Easy step-by-step directions.

Write for folder SW-6 and free Bonus Offer

Institute of Hydraulic Jack Repair
P.O. BOX 60 • BLOOMFIELD, N.J.
A Correspondence School Licensed by N.J. Bd. of Ed.

**RESIDENT SCHOOL COURSES
IN LOS ANGELES AND NEW YORK CITY**



Industry needs Electronic Technologists!

**LET RCA
TRAIN YOU IN
General Electronics
Technical Writing
TV, Communications**

Countless career opportunities are open to you in such fields as automation, guided missiles, radar, television, computers, and other industrial electronic applications.

RCA Institutes Resident Schools in New York City and Los Angeles offer you comprehensive courses that prepare you for the field of electronics you may choose. No previous technical training required. Introductory courses in Math and Physics available.

Coeducational Day and Evening classes. Free placement service. Applications now being accepted.



**The Most Trusted Name
in Electronics**

© RADIO CORPORATION OF AMERICA

Send to the school nearest you

RCA Institutes, Inc., Dept. SMR-80

350 West Fourth Street
New York 14, N. Y.

Pacific Electric Building
610 S. Main St., L.A. 14, Calif.

Please send me your FREE catalog of Resident School courses.

Name _____

Address _____ (PLEASE PRINT)

City _____ Zone _____ State _____

For Home Study Courses See Ad On Opposite Page

(\$1.49) is optional. Heads are drop forged steel, handle is hickory. To use, insert shaft of desired head in end hole and tap firmly on the wood block furnished. To release, place tapered end of pin in side hole and tap firmly. Available from Dumas Co., Dept. SH, 1 Jackson St., Worcester 8, Mass.

Auto Clothes Rack



• This aluminum auto-bar clothes rack has a telescopic adjustment which allows it to fit all cars. Just hang on the hooks already in the car. Extra hooks are included in the \$3.95 price. Available from Heywood's, Dept. CLG, 606 Summit St., Alton, Illinois.

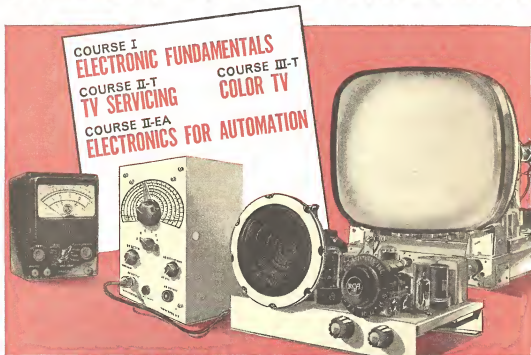
Small Craft Tooter

• For emergency or close quarter signaling and as a fog horn, this small craft whistle will have plenty of use. The plated, three-pipe whistle sports a chain lanyard that is



easily attached to becket or boat. Sounds like a steam whistle. Tagged at \$2.98, it's available from the Empire Merchandising Co., Dept. EAP, 140 Marbledale Rd., Tuckahoe, N.Y.—P. D. URBAIN.

RCA INSTITUTES **OFFERS YOU THE FINEST OF HOME STUDY TRAINING**



The equipment illustrated and text material you get with each course is yours to keep. Practical work with very first lesson. Courses for the beginner and the advanced student. Pay-as-you-learn. You need pay for only one study group at a time.



**SEND FOR THIS
FREE BOOK NOW**

For
Resident School courses,
see ad
on opposite page.

Licensed by N. Y. State Dept. of Education.

RCA INSTITUTES, Inc. Home Study School ZSM-80

A Service of Radio Corporation of America
% RCA, Camden 8, N. J.

Without obligation, send me **FREE 64-page CATALOG**
on Home Study Courses. No salesman will call.

Name Age
Please print

Address

City Zone State

Korean Vets! Enter discharge date

CANADIANS—Take advantage of these same RCA
courses at no additional cost. No postage, no customs,
no delay. Send coupon to:

RCA VICTOR COMPANY, LTD.
5575 Royalmount Ave., Montreal 9, Que.
To save time, paste coupon on postcard

YOUR WORKSHOP and MINE

Chord Organs Galore



Built by Eugene Hoover, Emporium, Pa.



Built by John M. Theisen, Topeka, Kansas.



Built by Albert Goldin,
Bridgeport, Connecticut.

So many of you sent in fine photos of chord organs built from our April '60 S&M plans, we decided to devote this column to them.

The prize-winning first photo (received in an envelope postmarked March 6th) was of the chord organ built by Eugene Hoover of Emporium, Pennsylvania. Close behind, with letters postmarked March 7th, were photos of organs built by John Theisen of Topeka, Kansas and Francis Pickett of Falmouth, Maine.

As you can see from these photos many of the builders added an original touch to the project—such as wrought-iron instead of commercial wooden legs, decorative stars or fancy paneling. All of them did a craftsman-worthy job of adapting the design to the size and brand of accordion available.

It's a real pleasure to see what you readers can do with a plan. It makes all the sweat and frustration that went into developing the original suddenly seem very much worthwhile.

Don Dinwiddie
EDITOR



Built by Francis Pickett, Falmouth, Maine.



Built by Carl Henderson,
Adelphi, Maryland.



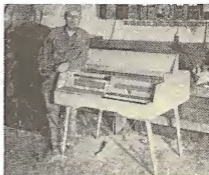
Built by Delas Reeder, Englewood, Colorado.



Built by Walter Mensching, Milwaukee, Wisconsin.



Built by Mr. & Mrs. Kenneth Wynia,
Lyle, Minnesota.



Built by John Diviggiano,
Chicago, Ill.



Built by Leonard Focchino, Joliet, Illinois.



Built by Donald Adams, Beverly, Massachusetts.



Built by Clyde Papps,
Claremont, N. H.



Built by W. Fred Homlin,
Raleigh, N. C.

Do-It-Yourself Guides

• Thirty battery-powered circuits using low-cost transistors enable experimenters to construct a broad range of high frequency, audio, instrumentation and entertainment equipment including audio voltmeters, transmitter modulators, microphone preamps and rain alarm systems. Transistors specified in the new Sylvania transistor circuit handbook permit experimenters to build the circuits at an average cost of \$5. The 50¢ book is available from Sylvania electronic parts distributors or from Sylvania Electric Products, Inc., P. O. Box 35-JL, Buffalo 9, N. Y.

• A concise pamphlet entitled *Short Course for the Novice License* is available on request from Eico, Dept. 313, 33-00 Northern Blvd., Long Island City 1, New York. The four-page brochure lists the Morse Code, many of the common abbreviations in ham radio usage, popular Q signals and radiotelephony call words. There is also general information regarding FCC requirements for becoming a ham operator and questions (with answers) similar to those in FCC examinations.

• Amidst anecdotes, *Grime to Shine* will take you from a grimy piece of furniture to a like-new conversation piece. Formulas are given for most of the finishes and instructions are given on how to remove spots and burn marks. Twenty-four page book retails for \$1 from the E. G. Warman Pub. Co., Dept. ACG, 8 Frankhoover St., Uniontown, Penna.

• A new manual describing the operation and use of the carbon arc welding process is available free of charge from the Arcair Co., Dept. MB, P. O. Box 431, Lancaster, Ohio.

• The guide book *Camping Maps U.S.A.* contains a map for each state showing campsites, public and private. The 134-page book also contains a key to facilities such as trailers, tents, fishing and boating and lists headquarters in each state where further information may be obtained. \$2.95 from The Village Store, Box 106-A-SM, Highlands, N. C.

• *Your Boat Needs Covering, Repairing, Protecting and Instructions for Applying Kristal Kraft* are free booklets that give full information on the recovering of boats with Fiberglas. Write for your copies to Kristal Kraft, Inc., Dept. JLD, 900 Fourth St., Palmetto, Fla.

• A collection of the most popular wheeled projects ever published by *SCIENCE AND MECHANICS MAGAZINE* goes on sale August 1. Included are plans for karts, powercycles,

scooters, midget racers, cycles (uni- and tandem), sidewalk cars for the youngsters, and vacation, camping and boat trailers. There will be **FOUR** big bonus blueprints in this book. You can get your copy of 25 Projects on *Wheels* (No. 568) at your local newsstand or by sending 75¢ to *SCIENCE AND MECHANICS*, 450 E. Ohio St., Chicago 11.

• The *Home Painting and Color Guide* outlines the principles of decoration by color groups. Printed in full color throughout its 48 pages. Color chip reproductions of ready-mixed colors are shown. Copies are available at 10¢ each from DuPont's Finishes Div., Dept. AP-64-SM, Wilmington 98, Del.

• "Cat" fans will want to obtain the booklet *How to Sail Catamarans*, a concisely written eight-page guide which describes the characteristics of catamarans and provides tips on handling them and various points of sailing. Accompanying the booklet is a waterproof pocket guide which summarizes the catamaran sailing instructions given in the booklet itself. Both are available free of charge from the publisher, Waverider Corp., Dept. HWS, 250 West 57th St., New York 19, or from Waverider dealers.

• The pocket-size manual *Sheet Metal Tables of Bend Allowance & Setback* contains information for a range of metal gages from 0.010 to 0.125, which covers most of the metal thicknesses used today. Bend radii start at $\frac{1}{32}$ in. and go to $\frac{1}{8}$ in.; bend-up angles range from 30° to 150° for direct reading. Interpolation and the use of 1° values make possible the calculation of bend angles not given directly in the table. Priced at \$1 by the J. L. Shipman Co., 9044 Ione Lane, Suite 515, St. Louis 23, Mo.

• The 10¢ booklet *How to Prune* tells and shows how to prune for the best shrubs, trees, fruits, flowers, hedges, vines and lawns. Available from Seymour Smith & Son, Dept. S-F, Oakville, Conn.

• Twenty-four boat-plan articles by *SCIENCE AND MECHANICS'* master boat builder, Bill Jackson, are included in Vol. 10 of the *Boat Builder's Handbook*. How-to-build instructions and show-how plans for building all types of boats, for all budgets and for builders and mariners of all levels of skill are given in this 160-page book, plus a big bonus 8-page fold-out blueprint for building a 14-ft. planing runabout. Copies of the 1960 Edition of the *Boat Builder's Handbook* (No. 567) can be obtained for 75¢ at your newsstand or from *SCIENCE AND MECHANICS*, 450 E. Ohio St., Chicago 11.

ENGINEERING



U.S. AIR FORCE Photo. Missile headed for outer space. Courtesy of Space Technology Laboratories, Inc.

Heald College Ranks FIRST
West of the Mississippi
in "Who's Who in America"
Send for FREE information
Enroll Now for New Term

Select any one of the 15 Modern Engineering Courses listed below. Any one of them will lead you to a Successful, Safe and Secure Lifetime Career.

BACHELOR OF SCIENCE DEGREE, 30 MONTHS

SAVE 2 YEARS' TIME

B.S. Degree Courses:

- ☐ Electronic Engineering
- ☐ Electrical Engineering
- ☐ Highway Engineering
- ☐ Mechanical Engineering
- ☐ Structural Engineering
- ☐ Civil Engineering
- ☐ Architecture

Diploma Courses:

- ☐ Radio-Television Plus Color Technician
- ☐ Electronic Technician
- ☐ Industrial Electronic Tech.
- ☐ Tool & Die Design
- ☐ Architectural Drafting
- ☐ Mechanical Drafting
- ☐ Structural Drafting

Approved for Veterans

HEALD ENGINEERING COLLEGE

Van Ness at Post, Dept. SM-29, San Francisco, Calif.

NAME _____

STREET _____ CITY _____ STATE _____

There's money
to be made

IN THE ORNAMENTAL CONCRETE BUSINESS

Manufacture—and sell—ornamental concrete products yourself. Easily, simply produced, here is a low-cost, do-it-yourself project that means money—Big Money.

CMC permanent, lightweight, high quality Aluminum Molds give you both ease of production and copyrighted designs that have set a national record of sales success.

Get the full story of this high profit, low cost business. Send today for your copy of the big, fully illustrated book "How to Turn Concrete into Gold." The clear, easily followed "from start-to-finish instructions" that show you how to produce beautiful, ornamental concrete products. Plus valuable sales and market tips. Catalog of over 200 Specialty Patterns. A complete industry manual.



Send \$2.00
for your
copy



CMC CONCRETE
MACHINERY
COMPANY, INC.
DEPT. SM
HICKORY NORTH CAROLINA



My pupils—from 11 to 87—prove YOU CAN HAVE A NEW BODY AT ANY AGE...

with New Health—New Strength!

Now—at last—you can quickly and easily GAIN pounds of solid muscle—or REDUCE unsightly, dangerous fat. Build a SUPER-PHYSIQUE, with POWERFUL, shapely muscles—OR—just keep fit and healthy . . . in top condition.

Billy Van says: "ALL YOU NEED IS A ROPE!"

My amazing scientific discovery, **ROPERCISE**. Guarantees Results in a few minutes 3 DAYS A WEEK! Write NOW for FREE Booklet.

BILLY VAN—PHYSICAL DIRECTOR

4634 Art St.

Studio 3

San Diego 15, California

Better Than
Your Own

SHOE STORE AT HOME

No investment, no experience needed. Just show magic cushion comfort to friends, neighbors, co-workers. Advance commissions to \$4.00 a pair, plus Cash Bonus, Paid Vacation, \$25.00 Reward Offer. Outstanding values for men, women, children. Money back guarantee. Shoe samples supplied without cost. Write TODAY for FREE new 64 page catalog and full details.

TANNERS SHOE CO., 673 BROCKTON, MASS.



"\$10,784 IN ONE YEAR"
SERVICING RADIATORS!
—Sidney Rad, Shop, Sidney, Mont.
Make good money servicing auto-truck-tractor radiators. Easy to learn. Inland, world's largest radiator equip. mfg., offers complete package—equipment merchandising, "Pay-for-your" Purchase Plan, free training. Small down payment on equipment starts you. Profitable dept. for garage or service station. Write:
INLAND MFG. CO., Dept. SM-4, 1108 Jackson St., Omaha 2, Neb.

be a CAMERA CRAFTSMAN
New opportunity for big-pay jobs or your own business. Now YOU can learn to repair cameras . . . at home, in your spare time! Free booklet tells how. NISC accredited course includes all instructions, tools, practice equipment. Write today!
NATIONAL CAMERA REPAIR SCHOOL
Dept. C-28, Englewood, Colorado

MAKE \$50 A DAY—AND MORE

Serrate—Sharpen—Table, Steak Knives

Full or part time—work anywhere. Every restaurant, hotel, etc., repeat customers. Write Today for proven daily profit plan. Guaranteed.



CUTTER-CRAFT

2590 Bersa
Pasadena, Calif.

CASTING SECRETS REVEALED

Big money! Cast 1000's of plaques, figurines, etc. with X.L. rubber molds. No experience, little capital req. X.L. rubber plaques \$2.50, qts. \$4 (postage extra). Molds, rubber for 3 molds \$1.50 ppg. U.S. Only. Send \$5.00 refundable with order for 40 pp. full catalog.

**HUGE PROFITS!
MORE MONEY!**

PLASTIC ARTS STUDIO, Dept. SM-1
3403 S. Madison St. Muncie, Ind.



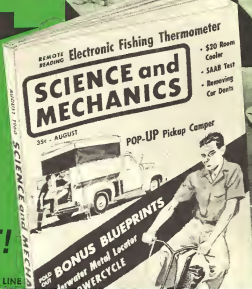
SPECIAL 30th ANNIVERSARY OFFER

USE CARD
BELOW

15 issues
for only **\$3.97**

You get the
equivalent of
3 issues **FREE!**

TEAR ALONG THIS LINE



**SCIENCE and
MECHANICS**

450 E. OHIO ST.
CHICAGO 11, ILL.

Yes!

Please send me
15 issues of
Science and Mechanics at
the money saving rate of \$3.97

☐

Payment enclosed

☐

Please bill me

☐

Extend present subscription

NAME _____
(please print)

ADDRESS _____

CITY _____ ZONE _____

STATE _____

(\$1.00 additional for foreign)

First Class
Permit No. 1058
New York 22, N. Y.

BUSINESS REPLY MAIL

No Postage Stamp Necessary if Mailed in the United States

— postage will be paid by —

**Mobile Home
JOURNAL**

527 Madison Avenue
New York 22, N. Y.

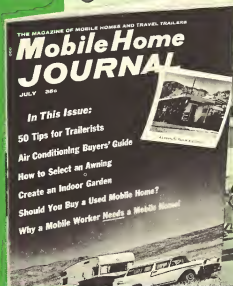
SPECIAL INTRODUCTORY OFFER

USE CARD
BELOW

15 issues
for only \$3.97

You get the
equivalent of
3 issues **FREE!**

TEAR ALONG THIS LINE



**Mobile Home
JOURNAL**

SM 860
527 MADISON AVE.
NEW YORK 22, N.Y.

Yes!

Please send me
15 issues of
Mobile Home Journal at
the money saving rate of \$3.97

- ☐ Payment enclosed
☐ Please bill me
☐ Extend present subscription

NAME _____ (please print)

ADDRESS _____

CITY _____ ZONE _____

STATE _____ (\$1.00 additional for foreign)



Dept. 617
Chicago 11, Illinois
450 E. Ohio St.

**SCIENCE and
MECHANICS**

— postage will be paid by —

BUSINESS REPLY MAIL
No Postage Stamp Necessary if Mailed in the United States

First Class
Permit No. 27710
Chicago, Ill.

FREE OUTFIT STARTS YOU IN BIG MONEY SHOE BUSINESS!



Run your own profitable shoe store business from home! Represent fast growing million dollar firm in spare or full time. We give you—**FREE**—complete Starting Outfit that makes you **\$217.00 EXTRA** each month for just 2 easy orders a day. You feature 195 fast-selling dress, sport, work shoe styles for men and women. Air-cushion shoes, many other special features! Sizes 2½-15—widths AAAA to EEE. Draw on 200,000 pair stock. Also horsehide jackets. Start now selling to friends, folks where you work. Rush postcard for FREE Outfit!

MASON SHOE, Dept. G-321, CHIPPEWA FALLS, WIS.



Make your own Gems 36⁵⁰

The Gem Maker's kit complete with all necessary equipment, including a super-charged diamond blade for sawing, and all the wheels for grinding, shaping and polishing, also complete instructions. The complete equipment as shown, less motor and belt for only \$36.50. C.O.B. Burlington, Wisconsin. Write today for information and literature.

B&I MANUFACTURING CO.
Dept. X, Burlington, Wis.



Would You Like to Make \$1,000 A MONTH?



That's what Stanley Hymen made selling the amazing new Presto Fire Extinguisher! Many others "cleaning up"—so can you! Amazing tiny new extinguisher ends fires fast as 2 seconds. Guaranteed for 20 years! Sells for only \$4.95. Write for free sales kit. Merlite Industries, Presto Div., 114 E. 32nd St., Dept. P-28H, New York 16, N. Y.

MONEY in DONUTS

Make new greenbacks donuts. Start in kitchen. No smoke. Sell stores. Cash only. No experience necessary. Free recipe. No obligation. Write! **J. RAY COMPANY, 3605 SOUTH 15th AVENUE, MINNEAPOLIS 7, MINN.**



BARBELLS

140-Pound, CHROME DELUXE Barbell. Dumbbells get only \$14.80. This is our feature set and is the finest ever manufactured.

Training with adjustable weights is the BEST way to keep fit; the ONLY way to develop great strength and a perfect body. As the oldest and best equipped barbell company, BUR gives value and prices no one can equal. Buy from manufacturer.

SEND FOR FREE CATALOG
BUR BARBELL CO.
Lyndhurst 7, New Jersey

EARN MORE BE A TAX EXPERT

Earn lucrative fees preparing income tax returns in your spare time during a month busy season every year or operate profitable Business Tax Service for year-round income. Experience needed. We train you at home. Low cost State Approved Course. Write for free prospectus. No agent will call. **UNION INSTITUTE, LAKEWOOD 60P, NEW JERSEY**

MONEY in WORMS

Big money made raising earthworms and crickets. Billions used yearly—unlimited market—Sell by mail—We teach you how to raise and where to sell. Learn about our new tremendous 8 to 12 inch African Redworm—in demand everywhere. Free literature. **CARTER CRICKET RANCH, PLAINS, GEORGIA.**

DENTAL PLATES BROKEN? \$2⁹⁸ FIX IT YOURSELF! MONEY BACK GUARANTEE



Why wait days for repairs? Do it at home in minutes. Save \$5 to \$10 on repairs by doing it yourself EASILY and INEXPENSIVELY with this new exciting "DENTURE REPAIR KIT." GUARANTEED to fix breaks, cracks, and loose teeth. Repair Denture Repair Kit on hand for emergencies. Mail order today with \$2.98 cash, check, or money order. Prompt shipment POSTPAID.

DENTURE REPAIR CO.
Dept. M-12, Chicago 45, Illinois

6447 N. Albany Ave.



"LITTLE ZIPSTER"

This one-man helicopter, Bensen Model B-9 hovers, flies forward or backwards, costs only \$3.00 per hour to fly. Uses outboard engine and regular gasoline, can be flown in your own backyard. Inexpensive construction is suitable for assembly by amateur mechanic. Drawings, specifications, design details and flying instructions—only \$5.00. Send for yours today. Factory-approved kits also available.

BENSEN AIRCRAFT CORP., Dept. 5M80
P. O. Box 2746, Raleigh, N. C.

SEND \$5

Name

Address

FREE

Full year's subscription to RADIO SHACK'S Sensational ELECTRONICS CATALOGS

Send coupon at once! See world's largest and best line of electronic equipment. Stereo, hi-fi, ham radio, tapes—over 100,000 items for pro or amateur—all at money-saving prices. 15-day no-risk home trial on any item.

MAIL COUPON NOW!

Radio Shack Corp., 730 Commonwealth Ave., Boston 17, Mass. Dept. 60-H2
Without further request, send latest catalog plus every new issue for one full year—all FREE and POSTPAID.

Name

Address

Post Office Zone State

or City

HIGH SCHOOL AT HOME IN SPARE TIME

Low monthly payments include standard text books and instruction. Credit for subjects already completed. Progress as rapidly as your time and abilities permit. DIPLOMA AWARDED

SEND FOR BOOKLET—TELLS YOU HOW

OUR 63RD YEAR

AMERICAN SCHOOL, Dept. HC13
Drexel at 58th, Chicago 37, Illinois.
Please send FREE High School booklet.

NAME

ADDRESS

CITY & STATE

Accredited Member NATIONAL HOME STUDY COUNCIL

Science Briefs

A manned fueling station like that shown in the foreground of the drawing could increase the range or payload of space vehicles by as much as 10 times, according to a research scientist of Northrop Corp., North Division, Hawthorne, Calif. An air-gulping powered satellite, the station would orbit in a region of very thin air. It would accumulate air, liquefy and store it. Part of this air would power the satellite and part would be taken on by outbound space vehicles, says Dr. Sterge T. Demetriades. Used for propulsion, the air could be heated or ionized and accelerated with nuclear energy, or it could be used as an oxidizer for chemical rocket fuel.



Having troubles with your potted plants? Their health may depend on the direction in which you rotate them. A New Zealand researcher studied several types of plants—cyclamen, scarlet runner beans and oats—under fixed conditions of light, temperature and humidity and rotated them once a day. He found that a clockwise rotation inhibited growth, while counterclockwise turning stimulated it.

Some bituminous coal can be made harder by irradiating it by neutron and gamma ray bombardment. This might ultimately lead to production of a better coke, according to researchers at the Bureau of Mines, Washington, D. C. The discovery could also lead to improvements in processes for changing coal to liquid fuels and chemicals.

Add hard liquor to the list of substances that might cause cancer. Dr. George S. Sharp, director of the Pasadena Tumor Institute, Pasadena, Calif., says 75% of oral cancer patients drink up to a half pint of hard liquor every day.

A newly patented airplane de-icing system removes wing ice by exploding it off. Pressure-sensitive tape holds a miniaturized detonating cord to the leading edge of the wing. A detonating unit with an initiating cap at one end of the cord has wire leads to connect the cap into a detonating circuit, which can

be actuated from the cockpit. Herbert C. Johnson, Minneapolis, Minn., received Patent No. 2,930,554 for the system and assigned rights to the Air Force.

Want to be a full-fledged linguist? It would be harder than you think, since research shows there are more than 3,500 languages which either are in use or have been used in some part of the world. The figures, compiled by Eric P. Hamp, associate professor of linguistics at the University of Chicago, do not include any of the many pidgin or creolized tongues.

How much will an attic fan cool your home? In tests conducted during a summer heat wave by Lau Blower Co., Dayton, Ohio, an average two-story house with a properly installed attic fan showed these temperatures:

	Without Fan		With Fan	
	Day	Night	Day	Night
Attic	130°	102°	103°	82°
2nd Fl.	102°	95°	85°	76°
1st Fl.	92°	90°	80°	75°

An atom of silver weighs less than previously thought. But don't worry—a dime is still worth 10¢. Recent measurements by the National Bureau of Standards, Washington, D. C., have set the atomic weight of silver at 107.873. The old measurement was 107.880. This means the atomic weights of other elements may have to be adjusted, since silver has been used as a standard.

A new, indestructible standard for the meter soon may be adopted. It would define the meter in terms of the orange-red spectral line of light emitted from excited atoms of krypton 86. The meter would be 1,650,763.73 times the wavelength of the line. At present,

"Thanks to your wonderful training, I have been able to earn \$20 to \$25 extra each and every week doing little locksmith jobs at home and after work at my regular job. This is the best trade a man can take up!"

Train at HOME—Earn While You Learn.

Add 50%—100% to YOUR INCOME with easy spare time earnings. Cash in on the nationwide shortage—trained locksmiths are in demand! Quickly step into a big pay opportunity job or start a high-profit shop of your own.

Earn Extra Money RIGHT AWAY! All Special Tools, Supplies Furnished FREE.

Age, education, minor physical handicaps don't matter in this growing trade. You can quickly qualify as a skilled locksmith. It's like a fascinating hobby. Study at home as little as one hour a week. Gain practical experience through well-illustrated lessons. Do real jobs on car locks, house locks, padlocks and safe locks, under the guidance of experts.

LOCKSMITHING INSTITUTE, Dept. 408
150 Park Avenue, E. Rutherford, N. J.


**SEND FOR
FREE BOOK!**

**PROFESSIONAL TOOLS
FREE
WITH COURSE**

APPROVED FOR
VETERANS

MAIL COUPON FOR FREE BOOK.

For a future as your own boss or in a high-pay job, write now for FREE illustrated book.



Accredited,
Nat'l Home
Study Council

————— MAIL COUPON NOW
LOCKSMITHING INSTITUTE, Dept. 40B
150 Park Avenue, East Rutherford, N. J.

Please send without obligation the FREE illustrated book, "Your Opportunities in Locksmithing." I understand no salesman will call.

Name

Address.....

City	Zone	State
------	------	-------

75 POWER TELESCOPE \$3⁹⁸
25X-45X-75X

NEW 3 in one telescopes. 3 variable 25X-45X-75X magnification. Brass bound. 23 power for ultra bright images 45 & 75 power for long range. Guaranteed to bring distant stars, moons, objects, sports 75 times closer.

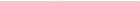
Most powerful scope sold anywhere this amazing low in made, 5 sections. ; contains 4 ground sed as powerful com-

telescope complete at \$3.98 postpaid. Money back guarantee.
CRITERION CO., Dept. SMA-50 331 Church St., Hartford, Conn.

ACCORDIONS UP TO 1/2 OFF

Save up to 1/4 off retail prices of comparable accordions

5-DAY FREE TRIAL
Buy DIRECT from world's Largest Exclusive Dealer! Compare our Importer-to-You prices! See how you saved Over 20 models—Giant, genuine Italian makes! New, easier terms! 5-Day Free Home Playing Trial, with satisfaction 100% assured. Bonus Gifts Free. Rush name and address for FREE Color Catalogs and direct Importer-to-You prices—FREE. Write TODAY! Accordion Corporation of America
200 Riverside Blvd., Dept. 5, Chicago 92



PARTIAL CONTENTS:

[illegible]

The illustration shows a three-dimensional perspective of a book titled "THE ENGINEERS ILLUSTRATED SAURUS" by "WILLIAM J. WOODS". The book is depicted with a thick spine and a cover featuring technical drawings of mechanical parts. The title is prominently displayed in large, bold, sans-serif capital letters on the front cover. The author's name is written in smaller capital letters below the title. The book is shown at an angle, giving it a sense of depth and volume.

- Separators
- Shelling
- Shifting Gears
- Shields
- Smoke Absorbers
- Softing
- Springs
- Sticks
- Stings
- Stomps
- Straps
- Straw
- Steam Power
- Stokers
- Stools
- Strapping
- Sound Receiver.
- Tappets
- Thermocouples
- Traps
- Valves
- Vaporizers
- Washing
- Winding
- etc.

A BOOK with OVER 8000 ILLUSTRATIONS WITH DESCRIPTIONS
of Mechanical Movements, Devices, Contrivances and Details

If you work with machinery of any kind, you may be called upon to devise or improve some job or motion. To do this, you either have to rely on memory, or experience, or the aid of some one else. But if you have **THE INVENTOR'S GUIDE** by Herbert Harkness—you will find over 8000 illustrations of the most common and useful kinds of motion, force or work! It is a compilation of the contrivances, parts, details, tools, machines, devices and appliances of all kinds that have been used by inventors, engineers and inventors over the years—to effect any motion or task. The material has been painstakingly assembled from the most reliable sources, and is arranged in a convenient, easy-to-use form. It includes all the latest engineering brochures, patent drawings, catalogs, etc. It is, in fact, a complete reference work for the inventor, engineer, or the only one which shows, side by side, the many different means and methods for accomplishing any particular task. It is a book that will save you a great deal of time and trouble. There are 8000 such illustrations—and each carries a pertinent description of its makeup and function. THE INVENTOR'S GUIDE is 380 pages, printed on coated paper. Price

Each one of these "ideas" is practical—just one may save you a lot of money—or—save on your costs—add to your profits!

Griffin Publishing Co., Dept. SM-8 only \$5.95
 31 West 47th St., New York 36, N. Y.

Send me a copy of THE ENGINEERS' THESAURUS by Herbert Bernheimer. If not satisfied, I can return book for refund.

☐ I enclose \$5.95; send book parcel post.

☐ Send book c.o.d. for \$9.95 plus 62¢ for delivery charges.

Order by Mail Name

Positive guar- Address

antee of money-back-if- City Zone . . . State . . .

not-satisfied.

A copy belongs in every reference library, school—every shop, plant, factory—with every machinist, engineer, student, inventor.

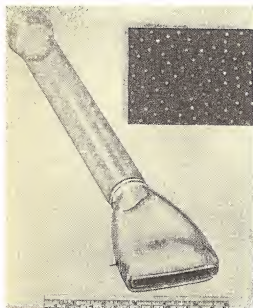
the standard is the distance between two scratches marked on a bar made of platinum and iridium, which could be damaged, lost or destroyed.

▼ ▼ ▼

Contrary to present belief, the radio waves coming from Jupiter might not be caused by volcanic eruptions. Dr. James W. Warwick says research at the University of Colorado's High Altitude Observatory, north of Boulder, Colo., indicates the planet has a magnetic field. The sporadic emissions are the result of collisions between this field and clouds of gas ejected from the sun, he suggests.

▼ ▼ ▼

This new cathode ray tube—with 35,000 wire conductors embedded in its face plate—enables the high-speed electronic printing of up to 20,000 characters a second. The conductors (each only .001 of an inch in diameter) are shown in the insert, greatly magni-



fied. They serve to transfer an electrostatic charge from an electron beam to moving paper. Developed by Corning Glass Works, Corning, N. Y., the bulb can also be used to transmit facsimiles by microwave or wire systems.

▼ ▼ ▼

Ever take a long airplane trip, then have trouble adjusting your eating and sleeping habits to the different day-night schedule? It's not just your imagination. Evidence points to the presence of chemical compounds within cells that somehow regulate your physical needs, such as the desire for sleep, says Dr. Charles F. Ehret, a scientist at Argonne National Laboratory, Lemont, Ill. He is now studying one-cell animals called paramecia

to learn more about this time clock mechanism.

▼ ▼ ▼

Scientists have succeeded in duplicating in a test tube the reaction that nature uses inside a living cell to create the nitrogen compounds necessary for life. They have discovered a technique by which nitrogen-fixing chemicals can be separated from bacteria and made to perform their function outside the bacterial cell. Full understanding of the process may answer many questions about the chemistry used by nature and could lead to greater farming efficiency, according to researchers at the Du Pont Co., Wilmington, Del.

▼ ▼ ▼

Plant breeders searching for disease-resistant plant material have an important new clue, thanks to discovery of substances in plants that determine their physiological susceptibility to diseases. A team of Federal-state scientists has discovered that a protein of the globulin type found in a particular race of flax rust fungus also occurs in flax plants susceptible to the same fungus. Plants resistant to that particular fungus do not contain the protein.

▼ ▼ ▼

Highway researchers have come up with some findings that could save taxpayers a lot of money. A research project of the Johns-Manville Corp., New York, N. Y., has found that the addition of 2% to 3% asbestos fiber to asphalt results in a tougher road surface. If put into use, this might reduce road maintenance costs by hundreds of millions of dollars, says the company.

And, repairs in concrete highways in California are now being made with plastics so strong that they hold even when the concrete itself breaks, says Bailey Tremper, supervising materials and research engineer for the California Division of Highways.

▼ ▼ ▼

Higher tensile strengths result when silicone rubber is stretched, then irradiated with high energy electrons. This is probably due to the extensive rearrangement of bonds within the rubber that occurs on irradiation, according to the General Electric Research Laboratory, Schenectady, N. Y.

▼ ▼ ▼

Life on Earth began some three billion years ago, according to a new estimate by a Yale University geologist. Dr. Karl K. Turekian arrived at that figure by measuring the amount and rate of the radioactive gas Argon-40 that is released from the Earth's interior, along with water and some other chemicals. The first life forms were extremely simple, he theorizes, and didn't get complex—or have skeletons—until about 500,000 years ago.

Pocket Transistor Radio

Mighty Midget
\$5.95



Low Price!
Smart Design!

Size of cigarette package, yet thrilling performance. Waits only 3 seconds to listen to music, news, sports, programs, etc. On this portable set, includes speaker-phone for private listening. Modern plastic case, ivory and blue with gold metal grille. Complete broadcast band. On-off switch one end. Complete, ready for immediate playing. Postpaid Only. \$5.95

JOHNSON SMITH & CO. Dept. 694 DETROIT 7, MICHIGAN

Catalog of 3100 Novelties 10c

New Send 10c for amazing catalog of novelties, live animals, scientific supplies, hobbies, funsters, places & birds, toms, magic tricks, joke articles, unusual seeds, gadget time-savers, cameras, optical goods, projectors, movies, lucky jewelry, religious novelties, discourses, musical instruments, stamps, coins, puzzles, fortune tellers, radios, auto & bike accessories, telescopes, magnifiers, compasses, banks, smokers' gadgets, art supplies, printing sets, engines, motors, shockers, knives, billboards, fireworks, guns, rifles, sports, books, games, plants, etc. Send name, address & 10c to Johnson Smith Company, Dept. 694, Detroit 7, Michigan

New Ram Jet Engine Burns Gasoline!

Powerful continual thrust for model boats, cars, planes. No moving parts. Easy to start. Runs on gas. About 6-in. long. Complete, Only \$1.50
JOHNSON SMITH CO., Dept. 694, Detroit 7, Mich.



TIRED OF HIGH RENT?

Learn how luxurious suburban MOBILEhomes can save money and expensive moving. Comes fully and smartly furnished, including many major appliances. Modern MOBILEhomes have every home comfort. Conditioned air provides comfort in any climate. Multiple bedroom units have convenient spacious storage areas. MOBILEhomes give you mobility, easy care, minimum maintenance. Learn how in TRAILER TOPICS—the magazine of luxury low cost living.



SPECIAL OFFER \$1.00
4 month subscription only

TRAILER TOPICS magazine

Suite 1528 28 E. Jackson Blvd. Chicago 4, Ill.

ABSOLUTELY FREE!



IN JUST 15 MINUTES I'LL PROVE I CAN GIVE YOU A VIRILE, RUGGED,

HE-MAN BODY!

In just 15 minutes, right in the privacy of your own room, through my TRIPLE-PROGRESSIVE COURSE, I'll slap pounds of steel-like muscles all over your body. I'll add 4 inches of power-packed muscles to your chest — another 3 inches of steel-packed muscles to your arms — I'll give you lifeguard shoulders and speedy, athletic legs. I'll also build inner strength and give you that virile look that men envy and women admire. LET ME PROVE AT MY OWN EXPENSE THAT EVERYTHING I SAY CAN BE DONE!

Send me this coupon and I will rush you my GIANT 48-PAGE COURSE that teaches you privately how you can become a real HE-MAN. DON'T MISS THIS ONCE-IN-A-LIFETIME OPPORTUNITY.

AMAZING
FREE TRIAL
OFFER

JOE WEIDER Dept. 39-80W
"Trainer of the Champions"
803 Palsade Avenue
Union City, New Jersey

Dear Joe:

Rush me my FREE POWER-PACKED MUSCLE COURSE. I am under no obligation, and I enclose 10¢ to cover handling and postage charges.

Name

Address

City..... State..... Age.....
In Canada: Write Joe Weider-2875 Bates Road, Montreal, Que.

Magic Mail Plan-Make up to \$5 an Hour!



THIS MAN... is taking out of the machine a Plastic Sealing Job — ordered by mail — only 11c in material cost brings back \$2.58 in cash by mail. Capacity of machine: \$25.00 profit per hour of operation.

Get ORDERS and CASH from your mail-man — do work in SPARE TIME at home — or expand into FULL TIME business. Send coupon for Free facts about the newest and most fascinating of all home operated businesses. For the first time a simplified machine brings the fabulous profits of Plastic Sealing and Plastic Laminating within the reach of the small operator. Any one can learn to operate the machine with a few minutes practice — then with our Magic Mail Plan can get mail orders pouring in daily with cash in every envelope. No canvassing — no selling. We even

Get into PLASTIC LAMINATING at home

supply the circulars you mail to bring back cash and orders. Don't waste a minute. Rush your name. We'll send you \$FREE and postpaid, pictures, prices, details, and all the facts you need to start. Mail coupon or send name on postcard. No charge. Warner Electric Co., 1512 Jarvis Av., Dept. L-5-J Chicago 26, Ill.

Make Thousands of Beautiful Art Creations
COSTUME JEWELRY • CIGARETTE BOXES
TRAYS • CANDLSTICKS • COASTERS
LAMP BASES • BOOK ENDS...ALL IN
SPARKLING COLORED PLASTIC



WARNER ELECTRIC CO., 1512 Jarvis Av.
Dept. L-5-J Chicago 26, Ill.

At no cost to me, please rush complete details postage prepaid. I am under no obligation.

Name

Address

City..... Zone..... State.....

NOW YOU CAN OWN

**2 1/2
ACRES**



GOLDEN VALLEY, ARIZONA

only \$10 DOWN!
and **\$10** A MONTH!

2 1/2 ACRES
\$695 FULL PRICE

equivalent in size to 10 average city
lots in America's fastest-growing
state . . . Arizona!



Few places on earth compare with wonderful Arizona. It's one of America's fastest growing states bathed in golden sunshine, possessed of healthful, exhilarating climate where fog and smog are unknown! Temperatures at Golden Valley average mid 60's . . . no sticky tropical heat here! Arizona's population has more than doubled since 1950.

HUNTING — FISHING — HAPPY LIVING!

Like to Hunt? You'll find the hunting of your life all around — and in! — Golden Valley. There are water-fowl, quail, cottontail and deer in abundance. Like to fish? There's no closed season on the Colorado River or the lakes it forms. Year-round you'll catch wonderful rainbow trout . . . fabulous fighting large mouth bass. Nearby Lake Mohave is part of the Lake Mead National Recreation Area, described as "one of the ten best fishing areas in the nation!" Watersports? Boating, water skiing and swimming are great!

ARIZONA — SUNSHINE STATE

"We've got the healthiest climate on earth," Arizonians tell you. Doctors send folks with respiratory ailments to this warm golden land of low humidity and exhilarating year-round climate. Temperatures average mid 60°. No fog, smog or dust. Population, growing by leaps and bounds: more than doubled since 1950. Manufacturing, booming! Employment, zooming! Land values: skyrocketing!

GOLDEN VALLEY RANCHOS

. . . is a new development in the 30 magnificent miles between Kingman and the Colorado River, near the fabulous Lake Mead National Recreation Area. For the first time, this peaceful desert Valley, ringed by purple hills, is being sub-divided into 2 1/2 acre parcels, each fronting a graded street, each equivalent to 10 average city lots. Tree-clad mountains, sparkling lakes, picturesque mining towns and a modern city are minutes away, thanks to State Highway 68 which runs through the Valley! Here is exploding Arizona in its most colorful expansion . . . a land rich in value today, even richer in its potential as Americans surge westward.

IMAGINE YOUR PROFITABLE TOMORROW!

. . . and insure it today. Arizona land prices in this area have tripled in the last five years. Golden Valley Ranchos undoubtedly will increase in value as Arizona's population expands. Today's offer of 2 1/2 acre parcels for \$895 each may never again be possible! And you can watch the value of your land rise . . . and rise! Then occupy it or sell it. "More money has been made in real estate than in all industrial investments combined," Andrew Carnegie said.

Prices may be changed without notice.



Mail \$10 for each Rancho desired to: **GOLDEN VALLEY LAND CO., Dept. 301, 3232 E. 1st St., Tucson, Arizona**

MAIL COUPON TODAY TO: GOLDEN VALLEY LAND CO., Dept. 301 3232 E. 1st St., Tucson, Arizona

Yes! — Reserve acreage in Arizona's Golden Valley for me — \$695 for each 2 1/2 acre parcel — payable \$10 down and \$10 a month including 6% interest. No other charges. Send purchase contract and map showing exact location of my holding. You will return my \$10 deposit if I request same within 30 days. I enclose \$10 deposit for each 2 1/2 acre Rancho desired.

SIZE ACRES	DOWN	PER MO.
2 1/2	\$10	\$10
5	20	20
7 1/2	30	30
10	40	40

Name: _____

Address: _____

City: _____ Zone: _____

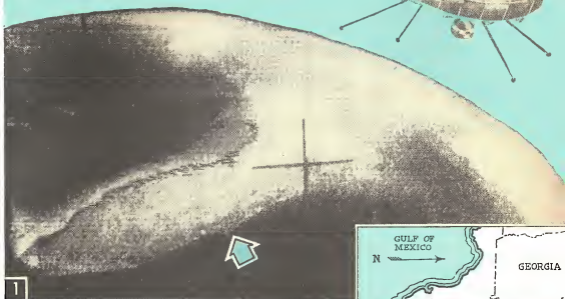
State: _____ Phone: _____

Reference: Phoenix Title & Trust Co.

Indicate No. of Ranchos _____ Total enclosed \$ _____

SCIENCE and MECHANICS

AUGUST 1960



Here a drawing of Tiros I is superimposed on a photograph of Florida taken by the satellite's wide angle lens from some 450 miles in the sky. Arrow shows location of Cape Canaveral. Note the cross in the center of the picture. This indicates the area that would be covered by a picture made by Tiros's telephoto lens.



How Tiros Photographs the World (including Russia)

The day of the high-flying spy plane may be over. America's camera-toting satellites will soon be ready to take over security reconnaissance work

By S. DAVID PURSGLOVE

IS America's first military reconnaissance satellite already orbiting the earth?

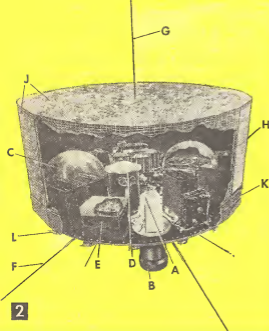
Tiros I—launched in April—was called a "weather observation satellite." But it has disturbed top U. S. officials the way weather never could.

Nobody expected the camera-carrying Tiros to do more than demonstrate the feasi-

bility of weather satellites (it actually *has* come up with significant, although not new, information about weather). But Tiros has embarrassingly done more for military spy satellites than it has for weather satellites.

Everything about Tiros worked perfectly, and the photo results, especially from a played-down telephoto camera, were far superior to anything the National Aeronautics and Space Administration had expected. The story of Tiros is thus one of success that was too good—of a job too well done.

How Tiros Works. The 270-lb. satellite was launched into orbit by a Thor-Able rocket. The drum-shaped Tiros has a 42-in. dia., is 19 in. high and carries two television cameras, each about 6 in. long and using half-inch



Cutaway drawing shows satellite's main components. (A) is one of the TV cameras; (B) is wide-angle camera lens; (C) indicates tape recorders; (D) electronic timer; (E) TV transmitter; (F) transmitting antennas; (G) receiving antenna; (H) solar sensor to measure position of Tiros with respect to sun; (J) solar cells; (K) de-spin mechanism, and (L) spin-up rockets.

vidicon tubes. One is a wide angle camera, with an $f/1.6$ lens, that covers 800 miles on a side. The other is a telephoto camera, with an $f/1.8$ lens, that covers 80 miles on a side and has a 10 to 12 power telephoto effect over the wide angle camera.

Speed of the electrically operated focal plane shutters is .0015 second, slower than shutters used in high speed sports photography. The shutters make possible a series of still pictures that can be stored on tape for transmission to earth as Tiros approaches one of the two ground command points. The recorders carry 400 ft. of tape at 50 ips. Erase heads located just behind the transmitter pickup enable the tape to be cleaned and ready for more recording as soon as the stored pictures are sent.

The pictures are sent to earth by 2-watt FM transmitters on the 200 mc band, a transmitter for each camera. Each camera also is coupled to an electronic clock that receives programming instructions from the ground. These tell the camera when it is to take its

pictures during the orbit following ground instructions. NASA says the clock for the telephoto camera failed temporarily, then corrected itself after a period of several weeks. During those weeks, however, the camera took pictures only when in range of the two ground stations (Fort Monmouth, N. J., and Kaena Point, Hawaii).

Solar Cells for Power. Covering the satellite are more than 9,200 small rectangular solar cells to provide about 19 watts of power and to charge nickel-cadmium storage batteries so the satellite can operate when not in the sun. Four transmitting antennas extend below the satellite, and one receiving antenna is on top.

Although the infrared identification sensors from which Tiros gets part of its name (Television and InfraRed Observation Satellite) were not included in the satellite, it does contain small infrared units for locating the horizon. These detect the difference between earth temperature and space temperature and let Tiros know when its cameras are swinging over earth or pointing into space. This information is sent to the ground, where it is converted to spin axis attitude data by a punch-tape recorder. This data for each photograph helps locate the area shown in the picture.

Tiros contains a second direction and orientation device. This is a North indicator which labels the direction on each photograph. Each of nine solar cells recessed around the satellite briefly views the sun through a narrow slit, producing an electrical signal whose strength is proportional to the amount of light falling on the cell. These pulses are transmitted with the pictures to the ground stations where rapid sun-angle computers process the information for display on a screen with the TV picture.

"Yo-Yo" Cut Spin. Tiros is stabilized in its orbit by spinning, like a gyroscope. When the satellite was separated from the solid pro-

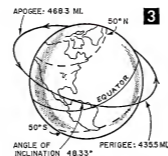


Diagram shows Tiros's orbit, covering a belt from 50° N latitude to 50° S. Traveling about 18,000 mph, the satellite circles the earth about once every 100 minutes.

pellant third stage, it was spinning at about 136 rpm. This was deliberately done by small rockets mounted on a spinning plate so that Tiros would follow a true path, just as a rifle bullet is spun for accuracy. However, pictures taken at 136 rpm would be blurred, so a de-spin mechanism slowed the satellite down to 12 rpm after orbit was accomplished. This mechanism proves that the key to genius often is simplicity. It was merely a cable with weights on the ends. The cable was wrapped around Tiros, and it operated

TIROS-EYE-VIEW OF RUSSIAN LAKE

Tiros took this picture over Southern Russia's Lake Baykal. The image was made by the wide angle lens from an altitude of about 450 miles, on the satellite's 35th orbit. The picture was then transmitted to the Kaena Point, Hawaii, ground station. Map shows location of the lake.



like a yo-yo; as it unwound, it reduced the spin speed of the satellite. It dropped away from Tiros when the desired spin rate was reached.

Although Tiros should not spin faster than 12 rpm for good pictures, it should not fall below 9 rpm or it will become unstable. When the satellite slowed down, however, as determined by ground measurements, NASA scientists signalled a set of small rockets to fire, speeding up the spin rate. There are three such sets of rockets, each good for one correction.

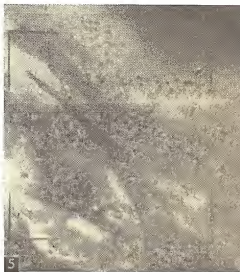
Inside the satellite is the anti-wobble mechanism, a system of travelling weights that move along vertical rods—opposite to the direction of wobble—to absorb the energy of wobbling instead of letting the satellite absorb it.

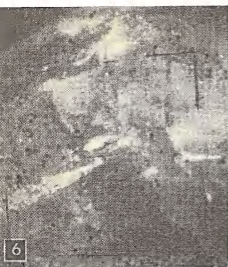
Tiros has sent back to Washington, D. C., via the Army's Fort Monmouth, many pictures of the earth and its clouds. In fact, its cameras functioned so

well that NASA had to speed up film processing to handle the volume.

In those photos made public so far, there is not enough detail to help military intelligence officers. Even the better telephoto pictures made after technicians learned how to adjust contrast on the faces of oscilloscopes from which they were photographing the pictures transmitted from Tiros may not contain the kind of detail that military planners hope to

This photo was taken by Tiros's telephoto camera before screen contrast was adjusted to give more clarity. The satellite was over the Gulf of St. Lawrence, looking west. The outline of the Gaspé Peninsula is visible in the lower left.





The Red Sea and part of the Mediterranean Sea are clearly shown in this Tiros photo. The line reaching upward from the Red Sea is the Suez Canal, and the black line to the left of the Red Sea is the Nile River. Note the crosslines indicating area that would be covered by a telephoto picture, which would show some features of Suez.



Ability of Tiros to spot cloud cover is shown in this photo taken by its wide angle camera when the satellite was over Saudi Arabia looking to the northwest. In the lower center is the island of Cyprus (arrow). Turkey lies to the north, covered by clouds. On the right can be seen the eastern shore of the Mediterranean Sea.

get from successors to Tiros. This fall, a more sophisticated satellite will go aloft, armed with a sensitive infrared sensor coupled to the photo system. Its photos not only will be much clearer and show more ground detail, but they also will classify objects on the basis of heat emission and absorption. Thin bands of roads and streams that look much alike will identify themselves.

Good Weatherman? Why all of this expensive, talent-consuming effort? What has Tiros accomplished so far? Actually, there is widespread disagreement among meteorologists and other scientists over the potential value of a weather satellite.

Mostly, Tiros has confirmed facts that we already knew. Its pictures of storms showed

weather that already had been reported from ground stations.

But even this is somewhat in its favor. A storm pictured by Tiros from over New Caledonia had been known for a week before the satellite was launched. However, the results show that it was possible to command Tiros to photograph a well-known storm so that weather researchers could learn which features in a photo correspond to specific conditions in a storm. After meteorologists do this often enough, they will be able to look at a satellite cloud cover photo and tell fairly accurately what the weather is like, even over unpopulated areas where they cannot obtain ground reports.

However, clouds are not the only aspect of weather. Dr. Harry F. Wexler, director of meteorological research for the U. S. Weather Bureau, described to a press conference at NASA headquarters some of the weather conditions observed by Tiros up to that time.

He showed pictures of a large storm 120 miles east of Cape

Cod. He noted that at the same time dry continental air was streaming off the United States, and it was not shown by clouds. Consequently, this important aspect of that area's weather was not spotted by Tiros. That same day, Tiros spotted clouds that indicated a large storm over the Midwest. Weather records reveal that in addition to overcast skies—the feature seen by Tiros—there was also a mass of cold air streaming in from Canada. This could not be spotted by Tiros.

Clear Spot Is Cold Air? But the fact that Tiros could not spot the cold air does not mean that it didn't show up in the Tiros pictures. On the contrary, after enough pictures have been correlated with known conditions, it is possible that meteorologists may be able

to say that a clear spot on a cloudy picture indicates cold air. The absence of detail in a photograph sometimes may be more important than visible features. Dr. Wexler and other weathermen admit this still is conjecture, since the careful analysis of Tiros's pictures has just started.

But many Washington reporters are wondering why, if the weather bureau needs a satellite at all, NASA did not just send up an improved Vanguard (see P. 81, June '59 S&M). It is less expensive and longer-lasting than the bulky Tiros, whose electronic components have an operational lifetime of only several months.

Vanguard's pictures can show only clouds, rather than any land masses, highways, railroads and such. Its pictures, though, would provide meteorologists with all the cloud cover information they need, all they can get

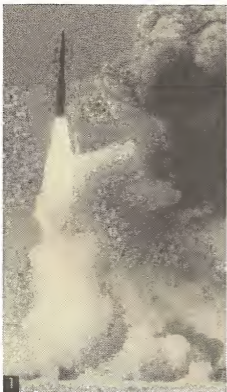
from the costly Tiros.

On the other hand, visualize the kind of picture that Tiros's telephoto lens may have taken, compared to the wide angle photos in Figs. 1 and 4. Figure 5 shows a Tiros photo made with the narrow angle lens before the oscilloscope screen contrast was properly adjusted. If the improvement in clarity caused by adjustment is as good as the clarity improvement in the wide angle lens pictures, we should be able to see large man-made features.

Nobody denies this will be possible with Tiros II and the later Nimbus weather satellite. Our military officials, indeed, hope it will be a foregone conclusion with the upcoming Samos Air Force recon satellite.

The only question remaining then, is: is the Tiros satellite already our first military spy in the sky?

Underground Silo for Minuteman ICBM



In the foreground, a Minuteman stands ready for launching while a special crane loads another into its underground silo. Once in its silo, the missile requires very little maintenance, says the Air Force. Automatic equipment indicates any malfunction in the missile or its ground support equipment, so it can be replaced with another.

THE Air Force has taken security wraps off its Minuteman ICBM and released this launch photo as well as the drawing showing the missile's underground silo.

The three-stage Minuteman has a speed of more than 15,000 mph and a range of more than 6,300 miles. Besides the silo launch sites, the missile will be deployed aboard

specially-designed railroad trains moving at random on the U. S. railroads.

Missiles launched in the current silo development tests are tethered by a heavy nylon cable to restrict their flight to a few hundred yards. In addition, the burning time of the solid propellant first-stage engine is restricted to only a few seconds.

Get Ready to Convert Your Boat to Water-Jet Power

This experimental boat, powered by Hydrocket, is making about 35 mph. The water-jet unit throws up no objectionable in-boat spray, although more outside spray than from a prop-driven boat going the same speed.

Within a few months you will be able to convert your boat to the exciting water-jet propulsion. Here's the exclusive story about the new experimental Hydrocket conversion unit

By JAMES JOSEPH

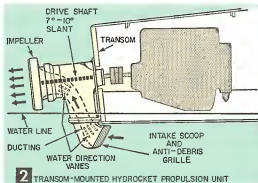
SOON now—within a few months—you will be able to convert your boat to water-jet propulsion, boosting its speed and fuel economy.

What promises so exciting a conversion is a multi-nozzled impeller which, spinning in air instead of water, looks and behaves much like a whirling shower head.

Replacing your conventional propeller, it can convert your inboard or outboard to water-jet power, the thrust of its jet spray boosting your boat's top speed by a hefty 5 to 15 mph.

"And it should nearly double the top speed of some racing boats, particularly hydroplanes," confidently predicts a spokesman for big Aerojet-General Corp., of Azusa, Calif., the new jet system's developer.

The lightweight unit, called a *Hydrocket*, weighs less than 40 lbs. and consists of an impeller, ducting and a water intake scoop. It can be hung from your boat's transom like an outboard, installed inboard (driven by your present engine) or fitted to your out-



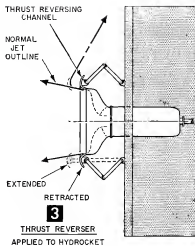
2 TRANSCOM-MOUNTED HYDROCKET PROPULSION UNIT
Drawing shows transom-mounted Hydrocket, powered by conventional inboard engine. Engine provides spin to the impeller, while underwater intake scoop adds ram pressure, increasing the unit's thrust. Aerojet found this scoop method far more efficient than flush-bottom intakes.

board motor, say Aerojet experts.

The result: rocket-like power and more speed than you ever imagined possible from your keel. Hydrocket literally leaps, full-throttled, from standstill to top speed—in seconds.

It can, moreover, turn a boat in its own length—due in part to its powerful water-thrust which suffers but few of the slipstream and other losses common to water-bound props.

More important, Hydrocket's thrust efficiency at full throttle remains essentially unchanged through the entire forward speed range. By contrast, prop efficiency falls off considerably above about 25 mph due to



cavitation—the prop literally out-running its water supply. At sizzling speeds, some hydroplane props manage but 10% to 20% efficiency. Hydrocket, at the same speeds, should retain fully 90% of its thrust power.

How It Works. Hydrocket is simplicity itself: the fast-spinning (500 to 13,000 rpm) above-water impeller draws water through a scoop that extends a few inches below the keel (Fig. 2). The water is ejected at tremendous velocity—upwards of 65 mph—through a score of small holes, called nozzles, along the impeller's periphery. Thrust, created as the jet stream hurtles rearward, rockets the boat forward.

Jetavators—aluminum vanes which deflect the water stream—substitute for a rudder. They are controlled by your boat's wheel or tiller. Other deflectors, these with cup-shaped appendages, shunt the jet stream downward and beneath the stern to put you in reverse (Fig. 3). Reverse is push-button controlled from the dash or by a shift-like handle.

Hydrocket's easy adaptability to any craft and its engine puts jet power within reach—and within the budget—of America's 8 million boat owners.

Shaft-driven from your existing inboard engine, it simply bolts to the transom and is hung like an outboard motor. Half a dozen bolts and a single 4-in.-dia. hole drilled through the transom (for the drive shaft) is all it takes for installation.

It can almost as easily be installed inboard, its impeller driven by an extension of your engine's shaft (Fig. 5). Mounted inboard, its water scoop projects from 3 to 5 in. beneath the keel while the fast-flying impeller juts aft, through a 4½-in. hole cut in the transom.

Conversion of existing outboards will be

Reverse "jetavator" diagram shows how simple, movable aluminum arms deflect jetstream downward and toward bow. In retracted position, the jetavators do not contact water stream. Extended, they intercept and redirect the thrust.



4 A



B

Key to the water-jet conversion is the Hydrocket unit shown in 4A. Typical unit weighs between 30 and 40 lbs. and measures only about 16 in. long, including the drive shaft protrusion. Unit shown here is designed for inboard mounting. The 9-in. impeller shown in 4B is set with 22 discharge nozzles. Note how the directional vanes cast into the unit are angled to compensate for clockwise spin of the impeller and send the thrust straight back. Impeller's peripheral speed is three times the actual speed of the boat, compared to the tip speed of a conventional boat prop, which normally is from two to four times forward speed.

more complex. Even so, the trick can be accomplished by the more mechanically adept of boat owners. Substituted for your outboard motor's "leg"—the below-motor section—is a Hydrocket leg which contains the water scoop, ducting, above-water impeller and a right-angle drive to your motor's power head (Fig. 6).

Three "Firsts" are Claimed by Aerojet for its Hydrocket:

- First lightweight, low-cost hydro thrust unit adaptable to any boat and its power plant.

- First water-jet proven both faster and more efficient than the propeller it replaces. It may prove, in fact, to be the fastest power package ever concocted for small boats.

- First jet unit keyed to a rotating impeller—the 9 to 11-in.-dia. spinning wheel which overcomes power losses inherent in more conventional water pumps and wrings maximum thrust from every gallon of water.

As you read this, Hydrocket prototypes, including a transom-hung unit powering Aerojet's new 17-ft.-long, 7-ft. beam three-point hydroplane, are gunning for new over-water speed marks.

Says hydro-expert Calvin A. Gongwer, who as head of Aerojet's Anti-Submarine Warfare Division fathered Hydrocket:

"We expect our 17-ft. hydroplane, powered by a 220-hp engine with 225 cu. in. displacement, to better the existing speed record for that class boat—114.118 mph set in July of 1959 by *My Sin III* over a measured mile."

Aerojet hopes to better that mark by anywhere from 20 to 50%.

Behind Gongwer's prediction lie more than six years of research, so let's draw sharper focus on this—a water-thrust power plant extraordinary, and one which seems destined to rocket many a small boat to higher-than-speedometer speeds.

Law-Abiding Jet. Like today's jet plane and missile engines, and like some water-jet marine propulsion units, including the Buehler Turbocraft (see p. 79, Oct. '59 S&M), Hydrocket hews to Newton's Third Law of Motion: *for every action there must be an equal and opposite reaction.*

Newton was talking about thrust—the product of mass times velocity. Explains S. G. Coon Jr., Hydrocket's project engineer:

"Jet aircraft engines achieve thrust by hurling rearward a tremendous mass of air at high velocity. Hydrocket simply substitutes water for air and achieves the same result."

Until Hydrocket's unique impeller, however, no water-jet system had been able to overcome pump losses—thrust losses seemingly inherent in big volume, high speed water pumps. And pumps supply the needed water mass which in turn creates thrust.

Some pump losses are due to skin friction, water-to-metal friction within various ducts. Turbulent energy loss—a disorientation of flow through a water-jet system—is another thrust waster.

Costliest, though, is conversion loss in the pump itself. In the process of pumping so huge a mass of water through the two or three stages of a typical axial flow pump, losses may run 30% or more.

Taken together, such losses greatly reduce thrust, thus power. Because they do, few water-jet system designers, until Hydrocket, have claimed greater-than-prop efficiency. And this, even though prop efficiency falls off notoriously at high speeds (Fig. 7).

"The average small boat's prop is only about 60 to 63% efficient at best," says Gongwer. "And at speeds of more than 35 mph, its efficiency drops to as little as 10% in some racing hulls."

And, although conventional water-jet pumps don't lose their efficiency at high boat speeds, pump and other losses in most of them reduce thrust to about 35% of the theoretical maximum.

Impeller Does the Trick. By contrast, Hydrocket accomplishes with a single impeller what most pumps only attempt to do with

two or three. The astounding result is that Aerojet claims 90% efficiency for its impeller and a healthy 40 to 63% over-all thrust output.

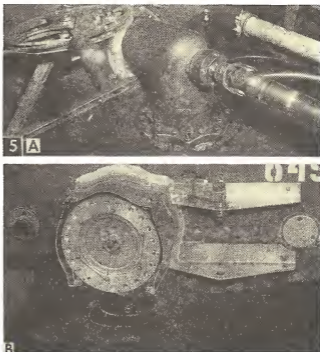
Chucking aside conventional high-loss pumps, Hydrocket designers brainstormed the impeller—a kind of centrifugal shower head.

As Hydrocket's only moving part (other than the drive shaft to which it bolts), the impeller acts as both a centrifugal pump and water ejector.

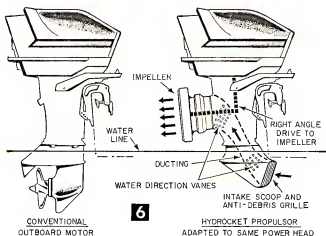
Two-inch-high internal vanes (cast into the impeller's backside) function as centrifugal impellers—pulling upward of 3,000 gallons of water per minute into the unit. Nozzles and their jet-spray directional vanes, machined into the impeller's face, control water ejection.

This water ejection is an operational "critical" for two reasons. First, nozzles must be able to eject essentially all the water pulled into the unit by the impeller. Second, their directional vanes must counteract the clockwise spin of the impeller itself—so that each tiny jetstream spews straight backwards, each contributing its thrust to the herculean total thrust.

"Without those directional vanes," says one engineer, "you'd have, in effect, just a shower head—a lot of water whirled out spoke-like from the impeller. Jet streams would cancel



Experimental inboard Hydrocket installation (5A) shows how small unit is mounted with water scoop down through keel and with shaft from engine running to impeller. Stern-end view (5B) shows position of impeller and below-keel scoop. Engine exhaust is to left. Mounting at right is for experimental rudder.



CONVENTIONAL
OUTBOARD MOTOR

HYDROCKET PROPULSOR
ADAPTED TO SAME POWER HEAD

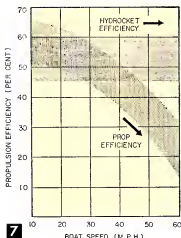


Figure 6 shows how Aerojet plans to adapt standard outboard motor to Hydrorocket propulsion. The motor is not changed. The under-motor section, however, is replaced by a unit containing a water scoop, water ducting, the impeller and a right-angle drive from the power head. Steering remains the same: when you turn the tiller, you change the direction of the jetstream and the boat. Aerojet chart (Fig. 7) shows efficiency of Hydrorocket compared to propeller-driven motor at various speeds. Note drop-off of prop efficiency after 25 mph. Hydrorocket efficiency remains unchanged throughout entire speed range.

one another's thrust. You'd have thrust, all right, but it wouldn't take you anywhere."

Nozzle Vanes Direct Jets. That Hydrorocket does take you somewhere—and speedily—is due to the impeller's built-in directional jet controls, the nozzle vanes.

The vanes, machined into the impeller's head and flanking each ejection nozzle, are nothing more than little grooved channels, angled from 35° to 65° outward and in the opposite direction from the impeller's rotation (Fig. 4B). They cancel out the clockwise spin of the impeller, straightening out each tiny water jet and assuring that the stream, despite the impeller's centrifugal force, is ejected straight rearward.

Because each vane's angle of deflection is fixed (machined as the vanes are into the impeller), it is set to straighten its jet stream at the impeller's fastest operational speed. This explains why Hydrorocket is most efficient at high speeds. And why, by contrast, it is somewhat less efficient than a prop at low speeds (under 30 or 35 mph). On the average, though, it is only about 10% less efficient, and at the absolute worst—20%.

In reverse, Hydrorocket is also somewhat less efficient than a prop-driven motor. Gongwer estimates Hydrorocket's reverse to be "between a third and a fourth as efficient" as its forward speed. The main reason is that the reverse deflectors route only a portion of the jet stream downward and beneath the stern.

The nozzles themselves are merely holes (.030 to .250-in. dia., depending on the impeller and its speed) equally spaced around the impeller's periphery.

One small-boat impeller is fitted with 22 nozzles, each about .250-in. dia.

Another, for a high-speed craft, is rigged with no less than 54 nozzles and jet stream directional vanes. And this, mind you, though the impeller itself measures but 9 in. dia. The impeller for Aerojet's record-seeking hydroplane has 24 nozzles, each .130 in. dia.

How fast the impeller spins depends both on the engine driving it and on design speed. Most impellers are directly driven by their engine's shaft. Small boat impeller speeds match engine speeds—3,600 to 5,000 rpm. Geared-up and hooked to a 220-hp V-8 as with Aerojet's hydroplane, impellers may rev at better than 13,000 rpm at top speed.

Thrust Angle Cuts Drag. Significantly, the hydroplane's jet unit, like others for less speedy craft, is inclined 7° downward. This thrust angle mounting is purposeful. Its aim: to lift the stern at high speeds, reducing drag.

Also significant is the below-keel water scoop—which departs from the flush-bottom intakes common to most other water-jet propulsion units.

"Sure," concedes an Aerojet designer, "we lose a bit in scoop drag, but we more than make up for the loss by 'ram pressure,' pressure ranging all the way from 10 to 600 psi, generated as the boat rockets along."

Gongwer's staff spent more than two years in scoop studies, testing six different types of intakes, both flush-bottom and scoop. Their conclusion: a vaned scoop, jutting 3 to 5 in. below the bottom, its 8½-in.-sq. inlet girded with a trash grille, is most efficient.

Taking advantage of the water's ram pressure, the scoop overcomes a bugaboo in some water-jet systems. At high speeds, some flush inlets simply don't get water enough. When they don't, their water-jet pumps may lose

prime, thus power—a loss similar to a prop's when, coming out of water, it spins uselessly in the air.

Thrust, Hp and MPH. Thrust is tied fairly closely to engine horsepower. As a rule of thumb, you can expect 10 lbs. of thrust for every horsepower. Hydrocket, hooked to a 25-hp inboard, should develop 250 lbs. of thrust. Hooked up to a 50-hp inboard, thrust ideally may reach 500 lbs.

Now, how does this thrust translate into over-the-water speed?

Well, marine designers aim, in small planing-type boats, for a performance that approximates a mile-per-hour for every engine horsepower. Hydrocket, although it comes close to this small boat ideal, doesn't quite reach it. Best speed-from-thrust to date has been about 22 mph from 23 hp. Thus, from a mere 230 lbs. of thrust, Hydrocket wrung close to the small boat optimum performance.

By the same yardstick, a 50-hp engine developing 500 lbs. of thrust should boom a craft along at better than 47 mph.

Much, of course, depends on the boat—its load and its design.

Gongwer believes Hydrocket will be wasted, its thrust efficiency cut drastically, if boat and gear weigh more than about 20

lbs. per shaft horsepower. To put it simply, if your engine develops 30 hp, and your boat, when loaded, weighs more than 600 lbs., it will respond sluggishly if fitted with a Hydrocket unit.

When and How Much? Says an Aerojet spokesman:

"Hydrocket conversion units should be in production and on the market within a relatively few months."

The conversion kit probably will cost more than the hardware it replaces—prop, shaft tunnel and such in an inboard. Gongwer figures 25% more as the maximum and hopes to get production units down to only 10% more.

This added cost, though, should be viewed in the light of the boat's higher speed and its increased miles per gallon.

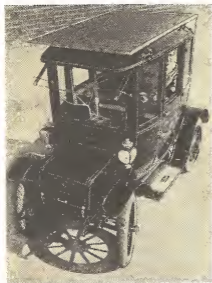
Fuel consumption itself—that is gallons burnt per hour—will stay exactly the same, since the same motor or engine is used. But since Hydrocket is more efficient than the prop at higher speeds and since this means higher speed for the boat from the same motor, you actually go farther on the same amount of fuel. Thus, your miles per gallon will be higher—assuming you use the same boat—while your gallons per hour remain unchanged.

Sunlight Powers Automobile

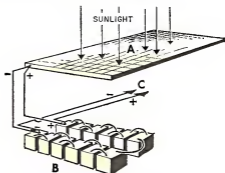
POWERED by the same kind of solar cells used in space vehicles, this car—a 1912 Baker electric—has a top speed of 20 mph.

The 26 sq. ft. panel atop the car contains some 10,640 silicon cells which convert sunlight to electricity. The car was rigged with the cells merely to demonstrate the potential of solar power conversion, and the cells produce enough electricity in eight hours of sunlight to run it for only an hour.

The system was developed by Dr. Charles A. Escoffery, technical assistant to the president of International Rectifier Corp., El Segundo, Calif. Cost of the solar cell panel is about \$15,000. In mass production quantities of a hundred or so, it could be sold for \$2,000 to \$3,000, says Dr. Escoffery.



Here's how the solar cell panel powers the electric automobile: Sunlight hits the silicon cells (A), which convert the light to electricity. The electrical energy is fed into storage batteries (B), a series connection of 12 blocks of 6 volts each. The controller and 3-hp motor (C) draw electricity from the batteries. Intermediate storage permits operation in the absence of sunlight.



New RW-3 Multoplane

Converts to Glider



Airborne, the Rhein-Flugzeugbau RW-3 shows contours remarkably like some jet trainers.

A unique German export offers wing extensions, better than 25 MPG, aerobatic claims and some fresh flying sensations

By RAY WHITMAN

Photos by the Author

ANY number of people who thought they knew air machines have been doing double-takes lately around Palwaukee Airport at Wheeling, Ill.

Picture, if you will, a little ship that might be mistaken at a distance for an underfed Air Force T-33 jet trainer (Navy TV or T2V). But when you get closer, instead of a jet tailpipe bringing up the rear, you find, right in the middle of the vertical stabilizer, a little propeller pushing like mad.

Fly alongside it a while

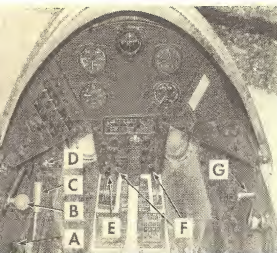
and admire the trim lines, but don't be startled to see the pilot lean forward and cut off all power. He's not about to make an emergency landing. Instead, he'll head into a nearby thermal (up-draft) and soar right on up like the glider from which the ship was spawned, sometimes climbing faster than you can under full power.

Or watch what looks for all the world like

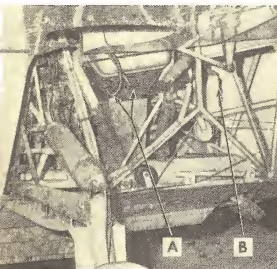


Wing positioning and all-plastic canopy of the RW-3 combine to give the pilot truly exceptional unimpeded vision.

a glider, complete with belly landing skid, as it swings into the airport pattern much faster than a glider has any right to be going. But don't get sore at this apparent sail-plane jockey, for he's not about to clutter up a busy runway with a belly landing. As he turns final, a full-blown tricycle gear comes down with a snap, and he's off the runway as fast



Only basic instruments are provided. Also note: (A) trim tab lever; (B) throttle; (C) gear retraction lever; (D) fuel cock; (E) nose wheel lock; (F) cabin heat, and (G) hand crank controlling flap position indicator.



Largely concealed by air-cooling ductwork, the tiny Porsche engine nestles right behind the main gear. With access panel removed, only lower sparkplugs of dual ignition (A) are visible. Five-quart oil tank for dry-sump system (B) rides behind engine, which links to propeller shaft by a drive shaft which has two universal joints.

as your powered craft.

First German Import. All of these and many more unusual features describe the Rhein-Flugzeugbau RW-3 Multiplane, first German light aircraft to be imported to the U. S. since World War II.

With it, the manufacturers have hoped to carve a slice of the sizable U. S. student trainer and personal transportation market. So also has George Priester, president of Palwaukee and importer of the first ship, who holds distribution rights and licensing rights to build this all metal and plastic plane here. But more than a few flies have turned up in the *Fleischbruehe*.

Start with the day when an air freight flying boxcar disgorged the RW-3 at Midway Airport, Chicago, assembled except for wings, tail assembly, engine and prop, which had been removed. It had been a rough crossing, resulting in a scratched canopy, broken plastic parts, a few dents and the like—enough to set Eddie Konefes, veteran Palwaukee mechanic (and a perfectionist), to tearing his hair.

"At least," Eddie thought, "it looks like an airplane." He trucked it home, not knowing how much of a beating his hair was yet to get. Then he opened the instruction package. Assembly guides, mechanic's manual, specifications, flight manual—all were in German, a language, it turned out, which was foreign to everyone on the field. *Donnerwetter!*

In the end, Eddie, who is a CAA designated inspector, remembered a friend who had been a mechanic in Germany. For some 40 working hours, even George Priester stayed out of the big work hangar, for many of the sounds coming out could be understood in any language. But finally, out rolled an airplane, ready to fly—or so everyone thought.

International Snafu. Unfortunately, the Federal Aeronautics Authority didn't think so. Priester and the manufacturers had understood that under reciprocal trade agreements, whatever was licensed in West Germany would automatically be type certified here. Not so. The FAA could find nothing like that in the fine print.

Thus the little ship had to start from scratch, under an "experimental" label, and fly through CAA testing just as though it were an entirely new American type. And, although it has come through some 40 hours of flight without mishap and with only minor modifications, licensing has not been completed as this is written. George has hopes.

Thus, too, it has been impossible for the writer to gain formal CAA approval to fly the ship, and we won't cut corners. Instead, we have carefully interviewed everyone associated with the RW-3 in the U. S. to bring you its story, chief among them young Charles Priester, son of the Palwaukee owner.

Charlie, 21-year-old Notre Dame graduate,

SPECIFICATIONS

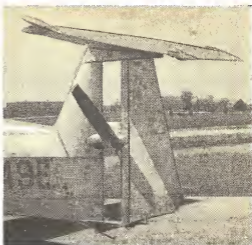
MODEL: RW-3 Multiplane, mfg. by Rhein-Flugzeugbau, GmbH, Krefeld/M = Gladbach, West Germany; imported by Priester Aviation, Palwaukee Airport, Wheeling, Ill.
 LENGTH: 24 ft., 4 in. HEIGHT: 8 ft., 2 in. SPAN: 34 ft., 1 in., or 50 ft., 6 in. with wing extensions.
 WEIGHT DRY: 1322.8 lbs.
 MAX. GROSS: 1984.2 lbs.
 PAYLOAD: 661.4 lbs. (18 gals fuel, 132 lbs. luggage plus two 210.7-lb. passengers)
 ENGINE: 4-cyl. opposed Porsche type 678/4 with 1.98:1 reduction gear developing 75 hp. at 4600 rpm. (prop 2320 rpm.)
 PRICE: "Just under \$10,000" delivered at Wheeling, Ill.

PERFORMANCE

Manufacturer's data based on U. S. Standard Atmosphere 59°F, 29.92 in Hg. at sea level. Tests in U. S., by Charles Priester, averaged over 40 hrs. flight, varying conditions, at Palwaukee Airport, Wheeling, Ill., 746 ft. alt.

	Manufacturer		U.S. Tests	
	(short wing)	(long wing)	(short wing)	(long wing)
Cruising speed (mph):	112	109	117	110
Stall speed (mph):	not given		47	40
Climb rate (ft./min.):	492	591	verified	
Descent (ft./min.):	354	246	1,000	1,000
Takeoff (ft.):	780	660	900	800
Range (miles, approx.):	500	500	verified	

(Note: Some variations may be accounted for by propeller variations—see text.)



Prop placement is claimed to diminish "torque" effects markedly while providing highly sensitive rudder action.

has been around aircraft since he was seven. He has done everything from washing planes and changing oil as a teen-ager to flying some of the hottest available. With his distinguished flying father and others, he had hundreds of dual hours before old enough to solo; was licensed within weeks of his 16th birthday, and was commercially licensed weeks after that. Since then, he has formally logged more than 2,200 hours. He flew the test flights in the RW-3, and we trust his judgment.

"In the air," Charlie says, "it's one of the smoothest ships I've ever handled. But when you first climb in you get the feeling you're going to be awfully lonesome." He's so right. Point is, there are no reference points to tell you whether you are straight and level, banking into a turn, or upside down and backwards. There are several reasons:

Multi-Purpose Design. Aside from conventional aircraft use, in which it is a two-place, tandem-seat pusher with its 75-hp Porsche engine in the fuselage behind the back seat, the RW-3 is designed for use as a powered glider or full glider. Thus, with the plane's own center of gravity far back, the pilot sits far forward, with the wings far behind him, as in gliders and some military and commercial types.

Gone are the wingtips you're used to seeing out of the corner of your eye; gone the familiar fan and rather flat engine cowling ahead of you. Instead, the whole thing, all nicely rounded, quits right in front of your feet, and there you sit out in front of God and everybody, with no horizontal or vertical lines to line up with the horizon. It might be

enough to shake a man, at first, for it will take a while to get used to the idea the rest of the thing is coming with you and to learn just where the rest of it is.

For full or powered gliding, accessory 8-ft.-2-in. wing extensions are offered, bringing the 34-ft.-1-in. span up to 50 ft., 6 in. The plane's normal plastic wingtip fairings (which resemble tip tanks) are removed, and extensions slide into place with a single bolt for fastening. (You still can't see them without turning your head.)

None of this bothers you much after the first few flights, Charlie reports. With or without wing extensions, the ride is smooth even in rough air, with a distinctly "big-plane feel." With the extensions, there's some feeling of wing flexibility smoothing any turbulence. It is, of course, on the heavy side for its class, with its dry weight of 1,322 lbs. exceeding, say, the Super Cub by 400 lbs.

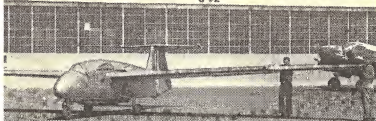
Incidentally, the RW-3 would be hard to overload. With full tanks (18 gals.) and a full 132 lbs. of permissible luggage (behind rear seat), you would have to put in two people totaling an unlikely 422 lbs. before you hit maximum gross of 1,984. We say "unlikely" because many 200-plus-pounders would find the cockpit a tight fit for shoulder room. Optional 32-gal. fuel tanks are available.

Quiet in Flight. "Most remarkable thing about the ship," Charlie Priester says, "is the noise factor in flight. Although the geared Porsche with its high engine speed gives a higher-pitched sound than usual, it's so far behind you you really hear more of the wind whistling past the canopy than you do of the engine."

Developing its peak 75 hp for takeoff at 4600 rpm, the Porsche is geared 1.98:1 to yield a prop speed of 2,320 rpm. Cruising at 4,400

PAL-WAUKEE AIRPORT

ELEVATION
642



Priester mechanics George Richter (left) and Eddie Kanafes hold one of the RW-3's wing extensions in position to show the enormous span available in soaring configuration.

damage.

Tricky Takeoffs. Fact is, Charlie Priester once had it on the belly skid—not on landing, but on takeoff. After several flights in which he “played it safe” by

rpm, according to Charlie, it will indicate a consistent 115-118 mph with the wooden prop with which the U. S. prototype is equipped. (CAA rejected the original distinctively-twisted German metal prop. A variable-pitch unit is also available.) With wing extensions, speed is reduced 6 or 7 mph.

At normal cruise, Charlie indicates, the RW-3 responds quickly and lightly to control action, but not objectionably so. “Call it something like the Stearman” a very highly regarded World War II trainer and utility ship. Nor will a slight change of attitude send you peeling toward the red line. (We know some you can throw out of trim simply by leaning forward in the seat.) At cruise, it burns about 3.7 gals./hour, yielding about a 500-mile range.

Trim (conventional flap in the elevator) is controlled by a sliding knob with notched locking positions, and flaps (Charlie says they are “highly effective”) are continuously variable, with a hand crank and indicator, up to 45°. In normal configuration, flaps occupy more than half the wing trailing edge, with ailerons outboard. When wing extensions are added, the surfaces which were ailerons now also become flaps, while control surfaces in the extensions become ailerons.

In either case, Charlie quarrels with the manufacturer's specified rate of descent of 354 ft./min. That might stand up, he feels, without flaps, but with full flaps down, 1,000 ft./min. would be more like it. He verifies the manufacturer's rated climb of 492 ft./min.

The ship stalls at about 46 mph without extensions and at about 40 with them, always with heavy warning buffeting long before. Held down to stall straight and level, it simply mushes down, and the nose must be pulled up to induce a breaking stall. It flies again immediately with the nose dropped or with power added.

Red-lined at 160 mph, it is said by the builder to be stressed for up to 150 hp for optional engines and is claimed to be fully aerobatic, although it has not yet been stunted here. Nor do we yet know the entry speeds for sharp maneuvers. Also, the builders claim, it can be put down on the belly skid without

holding the ship down until well over flying speed, he decided one day (with his father watching) to try a really sharp, showy take-off for Dad.

With the free-pivoting nose wheel locked straight down the runway, he poured on the coal and began feeding back pressure, hand on the gear retraction lever. Just over stall, she mushed off, not really ready to fly, and Charlie snapped up the wheels. Twang, she hit on the belly skid and bounced, skipping down the runway (happily, a long one) like a skimmed stone. Charlie sat contemplating his sins a moment until his speed took hold, and she flew off. Dad, of course, pretended not to have seen.

Since then, Charlie has concluded it's best to hold it on up to 60 or 65 mph, when it will fly off readily, and it's not distinguished for short takeoffs. Charlie estimates it uses about 900 ft., as against the specified 780. (It looks like more than that to the writer.)

Nor is Charlie completely happy with the gear arrangement. In what we think is a unique lash-up, the gear pivots upward with a linkage which includes torsion springs. To retract, you first pull a long lever which puts tension on the springs; then, when you flip the release, they snap up and lock. To lower, you push down the long handle, and again snapping the release permits gravity to carry them down to lock. But if you try either at too high an airspeed, they will stop midway, and you must pull them up again before snapping them down. It lands easily, mushing on gently right at stall speed almost straight and level.

All of these things, Charlie feels, simply require some getting used-to and some practice. It might, he feels, prove highly useful as a trainer, both for powered flight and gliding. And, he insists, it's a dream in the air. The writer, frankly, would be mighty hesitant about turning a beginner loose in it.

The manufacturers claim that absences of torque resulting from rear prop placement gives the ship aerobatic handling matched only by jets. Certainly, it will be interesting to watch, and it just might be a lot of people's cup of schnapps.

TOMORROW'S HOME:

Comfort in Cubes

1

Twenty-one hollow aluminum cubes with extender units and plastic roof domes form this scale model of the experimental Industrialized House. Spread-out floor plan (Fig. 4) provides privacy and isolates room noises.

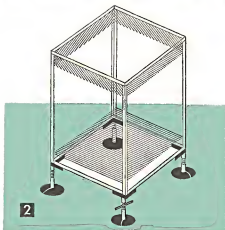
In a few years, do-it-yourselfers may be playing a gigantic game of dominoes—using aluminum cubes to build an efficient, mobile and low-cost home

By MERLE E. DOWD

HOLLOW aluminum cubes—12 ft. square with translucent plastic tops and variable wall panels—might be the building blocks for tomorrow's do-it-yourself homebuilder.

The cubes, which could be put together domino-like to form any floor plan you want, are the basic unit for a startling experimental "Industrialized House" which was brainstormed by famed designers George Nelson and Co., Inc., of New York.

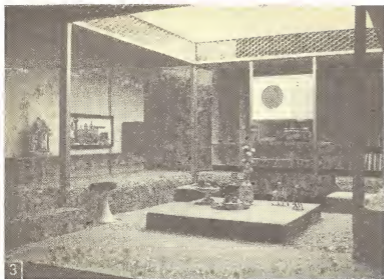
Nelson's group threw out the old-fashioned and inefficient ideas inherent in many of today's conventional houses. They concentrated their thinking on greatly improved performance, mass production materials, extreme flexibility and a minimum of building parts. As a result, the cube house offers



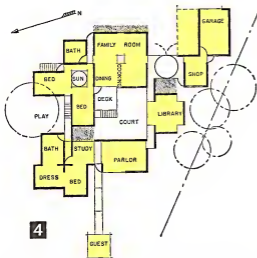
The basic building unit is a cage of aluminum posts and beams, with screw-jack legs that rest on aluminum foundation cones. The jacks adapt cage posts to uneven land and eliminate costly and immobile foundations.

many unique—and advantageous—features:

- Because the cubes, plus smaller extender units, could be assembly-line built and put quickly together on-site, building costs would be held to a minimum.



Inside a model of the cube house. Many furnishings are built in as a part of the basic structure—such as the storage wall at the rear. Extender units fasten to cubes to enlarge rooms, add design flexibility and provide corridors.



Floor plan of the house shown in Fig. 1 illustrates how cubes and extender units can be combined into a flexible and efficient room arrangement.

- Use of lightweight anodized aluminum would eliminate many maintenance problems and the need for footings and foundations. Instead, the cubes would rest on aluminum cones, with a screw-jack between the cube and the cone to adjust for uneven ground levels.

- If desired, the house could easily be disassembled, packed on a trailer and moved to a new location.

Covering the Cubes. Nelson recognized that most people are used to getting light from above. So the cubes' roofs would be domed

skylights, made of several layers of translucent plastic for natural lighting during the day. In areas where glare is troublesome, vari-colored liquids could be pumped into the air space between the layers. At night, soft indirect lighting would come from lamps in edge coves.

To cover the sides of the cubes, you would choose from a wide variety of interchangeable wall panels, which could be just simple walls or could have built-in picture windows, furniture, storage cabinets or shelves (Fig. 5).

To increase the flexibility of the basic cube and to provide corridors, 4 by 12-ft. extender units could be joined to the larger blocks. Where larger rooms are wanted, two or more of the cubes could be combined.

Why the helter-skelter room arrangement of the house shown in Figs. 1 and 4? It was carefully laid out that way to provide the utmost in privacy and quiet.

Massive walls—such as 3 ft. or so of concrete—will completely stop noise. But thin walls, like those in most homes, only muffle sounds, and in a factory-built house like Nelson's—where light weight is a must—unrestricted noise could be a serious problem.

So Nelson's solution was to separate the rooms and join them by corridors made of the smaller extender units. Since the cube house offers complete design freedom, it can be perfectly adjusted to the building site to provide the desired seclusion and quiet. The separated rooms also solve the problem of ventilation in areas where year-round air conditioning will not be built in. Small conditioner and heater units could be installed where wanted, or the insulated floor panels could be heated radiantly. In cold climates, aluminum panels could extend from the cubes to the ground to prevent cold air from blowing under the floors.

Easy Mobility and a minimum of on-site labor are necessary before homes can be truly factory-built and sold over the counter with anywhere near the same success as automobiles or refrigerators. The Industrialized House, by using only two basic building units and a variety of wall panels, fills these requirements.

The minimum number of parts could be manufactured on an assembly line and

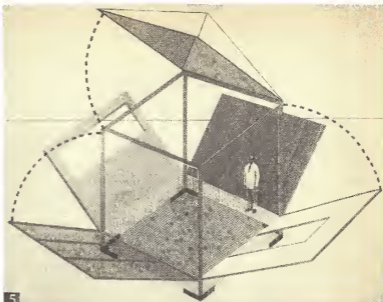
stocked in regional warehouses. You could shop in a store, pick out the building units you need, then have them delivered to your lot after having standard utility hook-ups installed at the site. Package units for heating or all-season air conditioning, kitchens and baths would fit into each cube as desired and would be independent of any large, overall system. A day after the components arrived, you would be living in your new house.

Then, suppose your company transferred you to another part of the country. Instead of going through the delays, expense and mental turmoil of selling your house and finding another, you could simply take down your cube house and ship it to your next location, along with your personal goods.

There, a day's work would see your house set up on a new lot. You would already feel at home in it, your furniture would fit it—and you might even decide to add another room or change the room arrangement, all for less than the cost of two real estate

commissions and the intangible losses that come from the usual frustrations of selling, moving and rebuying.

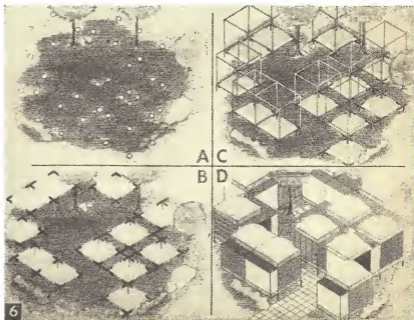
As yet, neither a projected sales date or cost of the Nelson cube house has been set, nor has one of the homes actually been built. But in a few years, when the last major product we all use—the home—is fully adapted to factory production, we may all enjoy comfort in cubes.



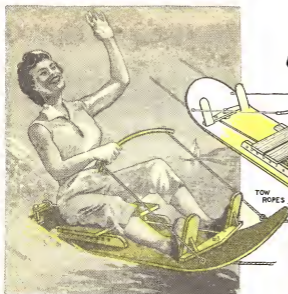
To wall-in the cube, a variety of interchangeable panels would be available—containing doors, windows, closets and other storage facilities.

These drawings show the major steps in setting up a cube house.

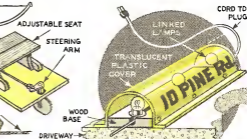
(A) After room arrangement is decided on, the aluminum foundation cones are laid out in their proper locations. (B) Screw-jack posts and floor structures are mounted onto the cones. (C) The cube's framework of posts and beams are assembled over the floor panels. (D) The extender units and dome roofs are attached to the cage to enclose the house.



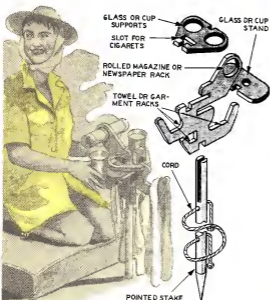
Parade of



Steerable Water Sled. Designed to be towed by a motor boat, this addition to the water sports family has an adjustable seat, a rudder controlled by pedals and two ropes which extend to provide a handlebar for the rider. Patent No. 2,910,708. William A. Albright, assignor to Albright Boat and Marine Co., Charlotte, N. C.

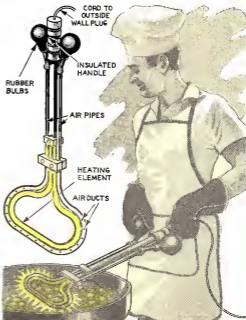


Illuminated Driveway Curbing is a boon to all those poor souls who—regardless of back-up lights—find it none too easy to back out their driveways. It also is likely to prove a great lawn saver and, with the owner's name and address painted on, a good addition to house or building identification. Patent No. 2,920,184. Milton Kessler, Youngstown, Ohio.

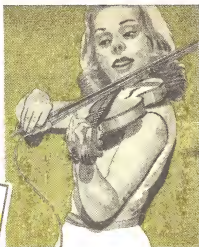
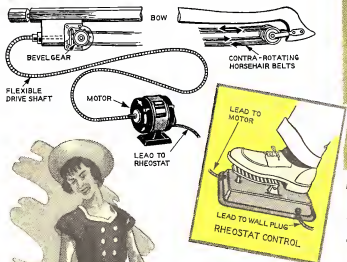


Knockdown Beach Hold-all has interlocking parts and can be set up easily—then knocked down and tied in a neat package for carrying. It provides convenient supports and racks for drinking glasses, towels and cigarettes. Patent No. 2,924,338. Bruce C. Sharp, Pitman, N. J.

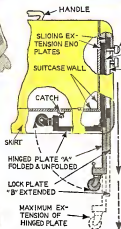
Electric Barbecue Igniter ends messing around with kindling and provides its own draft. Just plug it in, put some briquets in, add igniting fluid and squeeze the air bulbs to provide a constant draft. Patent No. 2,922,016. Narvy L. Persinger, Burbank, Calif.



New Patents



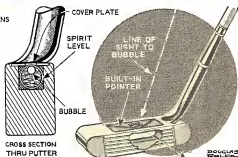
Mechanical Bow has two sets of endless belts which are rotated in opposite directions by a small motor. Pianissimo or fortissimo effects are obtained by varying speed with a rheostat. Patent No. 2,917,963. Luciano Lucchesi, Braamfontein, Johannesburg, S. A.



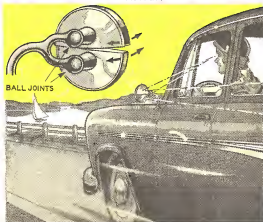
Roll-Easy Suitcase should be of benefit to anybody who has to tote heavy luggage around when traveling. It has built-in retractable wheels at each end which can be let down for trundling, then retracted and folded for ease of handling or storage during travel or at home. Patent No. 2,917,317. John Denholm, San Diego, California.

Dual Rear View Mirrors can give motorists a better look at the traffic behind them. In this bifurcated model, one half scans the vehicles directly behind, while the other half can be separately adjusted to give the driver a close view of the cars attempting to pass him. Patent No. 2,916,967. Alexander J. Husak, Flint, Mich.

• For more complete information on any of the inventions shown here, you may order copies of each original patent by sending your request with the patent number to Commissioner of Patents, Department of Commerce, Washington 25, D. C. Enclose 25¢ in cash for each patent.



Precision Putter for Golfers has a built-in level indicator and a directional arrow. The golfer stands so that a line drawn through the arrow point would pass through the golf ball, then keeps the bubble in view—assuring him he will stroke the ball correctly. Patent No. 2,919,922. Harry L. Skelly, Reno, Nevada.



Saab's front-wheel drive enables it to pull out of snow piles like this one with ease. At right, Saab makes a tight, wet turn with no side breaking loose.



suspension geometry, inasmuch as this car demonstrated a much smaller sway angle than the front-wheel drive Cord we tested.

Specific test figures show the Saab's side tilt on hard cornering to be an astonishing low 1° , which makes her just about the best curve-taker we've ever driven, outside of the sports car field. Of the new American compacts, Corvair came closest to Saab, with $2\frac{1}{2}^{\circ}$ tilt, while Falcon and Val-

iant both measured a considerably higher $3\frac{1}{2}^{\circ}$, the same as a 1937 Cord we tested.

For its size, the Saab has slightly harder steering than many other imports, and the front wheel drive is no doubt responsible. You soon adapt to the difference, however.

Saab's free-wheeling is nothing out of the ordinary, except that it's *there* (usually, you will find it only on the higher-priced cars). It results in easier shifting, especially on downshifts, since you needn't worry about matching engine speed exactly with car speed. It also aids fuel economy somewhat, because the car coasts without the engine giving any down-braking effect. This also means, however, that you'll probably use the foot brake more and shorten the life of the linings.

Fuel Miser. Because Saab is one of those

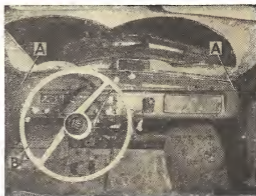
Road and Lab Tests on the Front-Drive SAAB

Why is Ford Motor Company developing a front wheel drive compact? A study of this Saab shows you some answers

WITH the Saab, an economy import from Sweden, almost everything of importance is up front. Like the classic Cord of yesteryear, the drive is to the front wheels. Also up front is the three-cylinder, two-stroke engine. And also reminiscent of another American design feature is the Saab's use of *free-wheeling*.

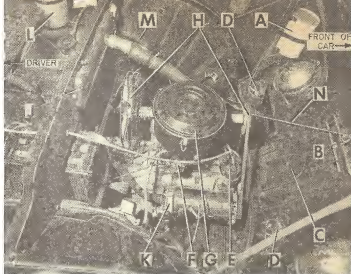
One benefit of the to-the-front design approach becomes obvious the minute you open the door of the Saab. There's no annoying driveshaft hump, front or rear.

Another advantage shows up the first time you let those front wheels *pull* you around a sharp corner, with a flat, nearly swayless action which practically challenges you to gun her some more. Partial credit for the lack of sway must rest, however, with the Saab's



Nicely laid out instrument panel. Note blow holes for side-window defrosting (A) and pull-chain control for shutter inside front grille (B).

Note how Saab's hood, including headlights and grille, lifts to expose engine. (A) is spare can of oil, and there's another under the front seat; (B) grille shutter; (C) protective cap for coil; (D) horns; (E) coil; (F) carburetor; (G) air cleaner; (H) fan and shaft to crank and generator; (J) radiator; (K) water pump on end of generator; (L) windshield wiper; (M) water take-off for heater, and (N) pull-chain control for grille shutter.



"foreign economy cars" that the new American compacts are supposed to compete with, let's see how its fuel mileage compares with our test Corvair (with automatic transmission) and test Falcon and Valiant (with manual shift):

	Miles Per Gallon		In Traffic	City	Country	Overall
	30 mph	60 mph				
Saab	37.3	24.8	22.0	29.7	25.4	
Falcon	38.0	25.9	19.0	28.1	22.7	
Corvair	28.8	23.7	16.4	22.9	17.5	
Valiant	28.5	20.0	18.3	22.3	18.3	

A fuel miser she is, although less so than several other small economy imports we have tested. But a jackrabbit she isn't. Saab's rear axle ratio of 5.43:1 seems made for acceleration, not economy, but the 38-hp engine just isn't husky enough to provide the pep, except at lower speeds:

	Acceleration (sec.)			Rear Axle
	0-20	0-40	0-60	
Saab	2.9	12.3	36.9	5.43:1
Falcon	3.6	9.6	21.0	3.10:1
Corvair	4.2	10.2	22.1	3.55:1
Valiant	3.1	7.9	14.1	3.55:1

Driver's Observations

ROADABILITY: Regular snowmobile in mean weather, with good stability on wet or snowy surfaces. Has a suggestion of a loping, sea-faring gait over bumpy or wavy roads, but it's not unpleasant. Takes long dips at speed with ease but shows short wheelbase buck on a quick succession of sharp bumps at low speed.

RIDING AND DRIVING COMFORT: Quick-steering traffic threader. Shift action is long travel and takes time for her to wind up. Test car was relatively noisy, between the sound of the engine wind-up, torque grunts on bumps and some traffic-speed body rattles. Vibrates a good bit at idle, but road throb when under way is about on par for small imports.

Seats generously cushioned; bucket-types in front quite comfortable, with 7-position backrest adjustment. To get into car, you back in with some ducking and sit down. Rear windows don't roll down; front windows take 4-plus turns, and there are no vents. Vision forward good; through rear window, poor. Inside rear view mirror small; outside mirror is convex type, which distorts distances. Hatroom generous in front.

Beautiful Bearings. How can an engine like Saab's two-stroke run without oil in the crankcase? Saab does it by using ball and roller anti-friction bearings. Since this type of bearing is a continuous ring (babbitt bearings are two half-circles), the Saab has a "built-up" crankshaft; that is, several pieces put together as the bearings are installed. (We'd guess that you can't trouble-shoot this yourself; you'll probably have to send the engine crankshaft with con rods attached back to the factory for repair. Of course, this should not be necessary for the life of the car.) The crankshaft has four single-row ball bearings, while the big ends of the con rods use double-row roller bearings.

Saab's carburetor does not have a choke as we have come to know it, but instead, you open a starting jet—really an auxiliary idling jet—by pulling out the "choke" control. Some caution is needed here: don't open the

INSTRUMENTS AND CONTROLS: Steering wheel comfortably positioned. Those who like to hold cross-spoke will find conflict on right side, where turn signal is close to wheel spoke. Brakes springy but sure. Clutch, brake and gas pedals quite close. Dials well placed for reading. Speed calibrated by 5 mph increments, with only every third one labeled. Temp and amp gages (no oil gage, of course).

Can cool engine by opening shutter inside grille. Visual labels on knobs (except starter) are nice. Dash light at night failed to light fuel and temp gages adequately. Ashtray and glove box (a small one) easy to reach. Doors have storage pockets. Padded sun visors swivel to side. Blower quite noisy on high. Wipers clap hands, leaving no center blind spot.

MISCELLANEOUS: Quality of assembly, finish, and weather-stripping well above average. Seam line-up excellent and double seaming insulation used along hood and trunk lines. Slope of rear window such that some snow from top tends to settle on top of window. Have to remove luggage to get at spare tire stowed under trunk floor. Carburetor has pre-heater tube leading to exhaust pipe to prevent icing and speed warm-up.

MODEL: Saab 93, 2-door sedan.

TEST DATES: March 1 through March 3, 1960

GENERAL ROAD AND WEATHER CONDITIONS: Spring weather, clear, 20° to 35° F, 29.2-29.8 in. Hg barometer; Portland concrete, generally smooth and level.

MILEAGE AT START: 2587.

MILES COVERED: 740.

GAS: Regular. **OIL:** Saab SAE 40.

CURB WEIGHT (with 9½ gal gas): 1880 lb; 56% on front wheels; 44% on rear wheels.

TIRE PRESSURE: 26 psi front; 24 psi rear.

SPARK SETTING: 8° BTC at idle rpm.

REAR AXLE GEAR RATIO: 5.43 to 1.

TRANSMISSION: 1.72 to 1 in 1st; 8.53 to 1 in 2nd; 5.23 to 1 in 3rd; 2.1 to 1 in reverse.

TEST DATA

FUEL MILEAGE: (checked with fuel volume flow meter and 5th wheel. Temperature 32° F; Relative humidity 80%; barometer 29.3 in. Hg).

LEVEL ROAD FUEL CONSUMPTION (carried weight 470 lbs. Average of two or more runs made in opposite directions over same road):

True MPH	30	40	50	60	65
True MPG	37.3	36.6	30.8	24.8	22.2
True Ton MPG	43.8	43.0	36.2	29.1	26.1

TRAFFIC FUEL CONSUMPTION (carried weight 460 lb): Simulated traffic pattern of city driving—stops, acceleration, braking, at speeds primarily of 30 to 45 mph:

True MPG	True Ton MPG	True Average MPH
22.0	25.8	22.6

CITY-COUNTRY FUEL CONSUMPTION (miles covered on 5 gal. fuel on course combining open road (country) and slower traffic (city) driving, at speeds of 30, 40, 50 and 60 mph):

True Mileage	True MPG	True Average MPH
148.7	29.7	33.0

OVERALL FUEL AND OIL consumed during test, including idling, warmups and all-weather driving:

Total Mileage	Total Gal Fuel	Total Oil	True MPG	Oil MPG
740	29.05	4 qts	25.4	185

ACCELERATION—LEVEL ROAD (timed with 5th wheel) carried weight 400 lb; Temperature 28° F; relative humidity 60%; barometer 29.4 in. Hg, average of two or more runs in opposite directions over same road:

MPH (True)	0-20	0-30	0-40	0-50	0-60	20-40	20-60
Time (sec)	3.90	8.10	12.3	22.4	36.9	8.6	33.2

GEAR SHIFT PATTERN: 0-24 mph in 1st; 24 to 43½ mph in 2nd; 3rd gear to speed. From steady 20 mph in 2nd, timed to 40 mph and to 60 mph, shifting into 3rd at 43½ mph.

QUARTER MILE SPRINT from standstill: 50.5 mph (true) in 22.9 sec.

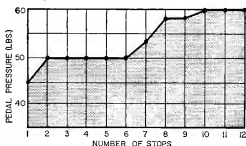
MINIMUM ACCELERATION time for 0-60 mph (true) over level road with no wind, best spark setting, Regular fuel and driver alone: 31.4 seconds.

SPEEDOMETER-ODOMETER CORRECTIONS: For 10 true miles traveled, odometer registers 10.10 miles. For 10,000 true miles traveled, odometer will register 10,100 miles.

Speedometer MPH	True MPH	Engine RPM	Speedometer MPH	True MPH	Engine RPM
72	70.6	5260	40	38.7	2880
70	68.6	5120	30	29.1	2160
60	58.3	4340	20	19.2	1450
50	48.2	3600			

LATERAL SWAY TEST OF CORNERING ABILITY: At steady 40 mph on 285-ft radius circle, side tilt angle recorded was 1°.

BRAKE FADE TESTS (repeated applications of brake from 50 mph to 30 mph at deceleration rate of 7 ft/sec²): As indicated below, pedal effort did not double in 12 test stops.



LONGITUDINAL DIP ON BRAKING: At a steady deceleration rate of 21 ft/sec², body nose driving angle was 1¼°.

PARKING BRAKE TEST: When brake was applied hard and suddenly from 20 mph true speed, car braking distance was 36 ft. Left wheel locked; right wheel locked.

CHASSIS DYNAMOMETER HORSEPOWER (tests made by Clark Automotive Service, Chicago): Temperature 50° F; relative humidity 80%; barometer 29.2 in. Hg.

MPH True	Engine RPM	Horsepower
50	3600	19.0
39	2800	15.5
28	2000	9.5

Per cent of advertised engine horsepower (38) to rear wheels: 50%.

ESTIMATED ANNUAL FUEL COSTS: \$132 for 10,000 miles (Using Regular gas at 32¢ a gallon and Saab SAE 40 oil at 45¢ a quart).

CALCULATED PERFORMANCE FACTORS

True MPH at speed of max. advertised HP in hi-gear	67
True MPH at speed of max. advertised torque	29
Engine rpm at 60 mph (also rev. per mile)*	4480
Average piston speed at 60 mph (also ft./mile)*	2140
Cu. ft. per minute of mixture at 60 mph (also cu. ft./mile)	
— a theoretical measure of fuel economy—low values desirable	59
Max. engine RP (adv) per ton of car (curb wt.)—a theoretical measure of acceleration performance—high values desirable	38.4
Max engine HP (adv) per cu. in. displacement—a measure of design excellence in producing power—high values desirable	0.83
Power performance factor (a weighted average of CR, displacement and curb wt.). This is a theoretical measure of potential acceleration.	39

* Lower values indicate less wear and stress on the engine.

Above data and signed certification are reproduced from test reports.

CERTIFICATION

I certify that the test results in this report are the actual findings obtained in tests, conducted in accordance with good engineering practice, on the automobile named and under the conditions specified.

Edw J Chert

Member, Society of Automotive Engineers, American Society of Mechanical Engineers, Director, Automotive Research Laboratories, Professional Engineering Consultants.

TECH TALK

Two-Stroke vs. Four-Stroke. A two-stroke cylinder provides a power stroke for every revolution of the crankshaft. The much more common four-stroke cylinder requires two revolutions for a power stroke. So you might think that the two-stroke can produce as much horsepower as a four-stroke twice its size. And it *could*, if the breathing of the two engines were identical—if the same weight of fuel were inducted into each engine.

But the four-stroke engine, with its separate intake and exhaust strokes, does two things better than the two-stroke:

- It expels more exhaust gas on the exhaust stroke.
- It inducts more fresh fuel mixture on the intake stroke, since the intake port is open longer than with the two-stroke.

Hence, a three-cylinder two-stroke (such as the Saab's) does not equal a six-cylinder four-stroke, but instead comes within about 30% of doing so.

The two-stroke also has several shortcomings. First, as any power lawnmower owner will tell you, it is usually harder to start than the four-stroke, and there is the nuisance of having to add oil to the gasoline.

Two-Stroke Advantages. Pound-for-pound, however, the two-stroke engine packs more power than its four-stroke counterpart, due to that power stroke every revolution. Thus, the three-cylinder Saab, with about one-third the displacement of the six-cylinder Corvair (46 cu. in. compared to 140), produces almost half as much horsepower (38 hp compared to 80). In addition, its oil consumption is a fixed quantity; it won't increase with engine wear. Our test Saab used a quart of oil for every 185 miles, since the oil was mixed directly with the gasoline (mixing ratio of 1 qt. oil for 8½ gals. gas).



Saab trunk with portion of floor board removed to show the spare tire hidden below floor. The box is a kit of spare parts, sold as extra equipment.

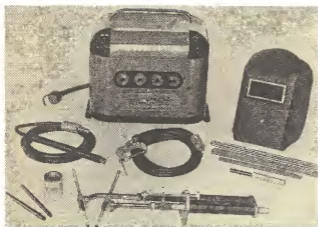
throttle while starting, since the starting jet needs engine vacuum in order to operate.

The Saab 93, with front-opening doors like our test car, is no longer being imported. In its place is the 93F, with doors hinged in front, but in other respects, it's essentially the same car. Saab's port-of-entry price is \$1895, which includes such "extras" as heater, whitewall tires, undercoating, outside rear view mirror, windshield washers and a clock.—WAYNE WILLE.

Measurements and Specifications

Make and model	Saab 93 sedan	Highest curb bumper will clear (in.)	13
Engine type	Water-cooled 2-stroke	Inches of overhang (front and rear)	26, 36
No. of cylinders	3	Door width opening clearance (in.)	46
Bore and stroke	2.59 x 2.87	Inches of headroom (front and rear)	38, 34
Piston displacement (cu. in.)	46	Front legroom (in.)	45
Mean effective pressure (lb/in ² @ rpm)	171 @ 2200	Rear knee room (in.)	6 to 9
Adv. max. horsepower @ rpm	38 @ 5000	Rear seat depth (in.)	16
Adv. max. torque (lb-ft @ rpm)	52 @ 2200	Inches of hip room (front and rear)	19 (bucket), 45
Fuel specified	Regular gas, SAE 30 or 40 oil	Inches of seat height (front and rear)	12, 12½
Compression ratio	7.3:1	Inches of shoulder room (front and rear)	46½, 43½
Turning circle (curb-to-curb)	39'11"	Inches of max. seat travel (lat. and vert.)	3, ½
Overall steering ratio (manual)	14:1	Windshield (sq. in.)	647
Torque to turn (lb-ft)	6½	Rear window (sq. in.)	364
No. turns, lock-to-lock	2¼	Luggage lifting height (in.)	23
Wheelbase (in.)	98	Driver's eye-to-road distance	Left side 18" 19" Center 24" 1" Right side 25" 3"
Overall length (in.)	158	Battery	12 volt, 33 AH
Overall width (in.)	60½	Fuel tank capacity (gals.)	9½
Unloaded overall height (in.)	55½	Oil fill capacity (qts.)	0
Min. car-to-road clearance (in.)	7⅞ at rear tail pipe	Radiator capacity (qts.)	6.8
Worst hump and dip car will clear (radius)	12'4", 21'3"	Transmission capacity (qts.)	2
Max. driveway angle car will clear	12°	Tire size and ply	5.00 x 15, 4-ply
Highest curb doors will clear (in.)	13		

Home Shop Work Savers



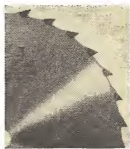
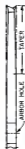
Low-Cost Portable Arc Welder. Designed for auto repair, farm and home workshop requirements, this outfit welds metal up to $\frac{1}{4}$ in. thick. Electrodes from $\frac{1}{16}$ to $\frac{1}{8}$ in. are accommodated. With an auxiliary arc tarch, the unit can be used for brazing, soldering, heating and bending on ferrous and non-ferrous metals. Called the Model M9T, the outfit consists of the transformer unit, two 6-ft. welding cables with insulated taper plugs, adjustable helmet, flux, electrode holder, ground clamp, starting carbon, aluminum and steel welding rod, bronze brazing rod and an operating manual. Operating from a 110- or 220-volt AC source, the welding current range is 20-95 amps. Made by the Metal & Thermit Corp., Dept. BMA, Rahway, N. J. Price \$75.



Vented handle on this soldering iron stays cool to the touch. Internal heat is eliminated so terminals do not burn out. Variety of tips from 25 to 50 watts available for as low as \$1.25 each. Tiplet points for close tolerance available. The $\frac{5}{16}$ -in. unit weighs, with cord, 2 oz., lists at \$2.50. Made by Sidco, Box 312-SM, Venice, Calif.



New style blade for radial-arm saws is taper ground for strength and blade stability. Each blade is rolled tensioned as well as straightened to a minimum of run out tolerances. Deep hardened, hard-tip blade may be resharpened. Does not require extra wide set; is said to cut consuming less than half the power used by the average 9-in. blade. Available in combination, cross-cut and planer type blades from Seiple of Canton, Dept. OLP, 2213 Cleveland Ave., N.W., Canton 9, Ohio.



SCREW CHK'R		Ruelle Brothers SPECIALTY MANUFACTURING P. O. Box 114 Ferndale, Mich.	
SIZE	NO. 1	NO. 2	NO. 3
1/4"	64	72	56
3/8"	56	64	56
1/2"	48	56	48
3/4"	40	48	36
1"	32	40	32
1 1/4"	24	32	24
1 1/2"	20	24	20
1 3/4"	16	20	16
2"	12	16	12
2 1/4"	8	12	8
2 1/2"	6	8	6
2 3/4"	4	6	4
3"	3	4	3
3 1/4"	2	3	2
3 1/2"	1	2	1
3 3/4"	1	1	1
4"	1	1	1

Screw checking device tells the size, thread count, top drill size, clearance drill size, length, top series and basic diameter for every commercially important bolt, cap screw and machine screw made in the U.S. up to $\frac{1}{2}$ -in. diameter. In addition it tells size and length for wood, sheet metal, self-tapping and drive screws, standard rivet sizes and most of the common cotter pin sizes. Plastic unit measures 3 x 5 in., costs \$1.75. Made by Ruelle Bros., Dept. RR, P.O. Box 114, Ferndale 20, Mich.

A lock, slipped onto the prongs of any two- or three-pronged electrical appliance prevents unauthorized use. Made by the Hurd Lock & Mfg. Co., Lock Div., Almont, Mich., the Power-Blok retails at \$1.49. Distributed through hardware and department stores.

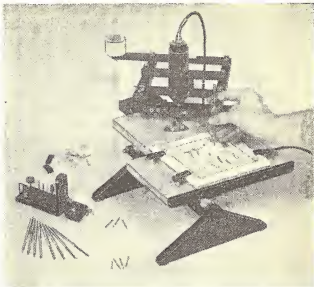
Pantograph Carves in 2-D or 3-D



THIS 2-D or 3-D ball bearing pantograph will carve or engrave wood, metal or plastic.

It can be used for making such things as lettering, molds, engravings, jewelry and model parts. A highly accurate machine, it has seven settings—ranging from a $\frac{1}{4}$:1 to a $\frac{3}{4}$:1 ratio—for reduction carving only.

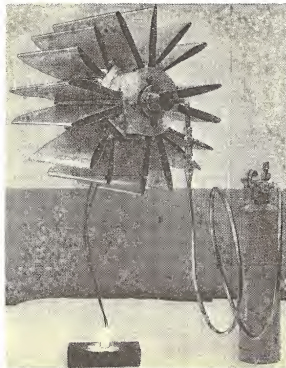
The complete machine, including router bits, clamps, tool sharpener, grinding wheels, wheel dresser and double bed adjustable stand, sells for \$67.40. A hand



Here the pantograph's stylus is used to trace a 3-D floral design, while the router bit carves a miniature pendant of the same design out of wood. Inset photo shows the pendant and a smaller earring.

grinder can be added for \$19.95. Manufacturer is Bench-Craft, located at Rolling Meadows, Illinois.

New Unit Turns Heat Into Power



TEN dollars worth of propane gas is all it takes to run this thermoelectric generator for a year—producing a steady five watts of power all the while.

By storing 1,000 lbs. of propane (about \$50 worth) with the generator, it could run unattended for five years, says its developer, the General Instrument Corp., Newark, N. J.

The unit was designed as an unmanned source of power for areas where other sources of electricity are not available or, as with batteries, must be replaced or recharged. Single evaluation samples of the unit are available for about \$5,000, but the company plans to sell it for \$500 or less when large-scale production gets under way.

No moving parts in this 10-lb. thermoelectric generator. Propane gas is fed into the generator (suspended sideways), where it burns steadily. The heat, captured in a combustion chamber, is converted by thermopiles of semiconductor elements directly into electricity, lighting the small lamp. The specially-designed burner uses more than 85% of the fuel's heat content. Heat not used by the thermopiles is conducted to the aluminum heat rejection fins which give the unit its star-like appearance.



1 Remarkable New Amphib Camper

Open up a 40-hp Johnson outboard, and the amphibious Cee Camp gets up speed quickly and planes on its pontoon hulls. Two water skiers could be towed, since top speed of the craft is about 30 mph.

The latest addition to the fast-growing pickup camper family is this versatile model that rides both roads and waves

By JOE H. WHERRY



After backing your truck to the water's edge, first step in getting afloat is to lower the pontoons. During on-road travel, they are secured atop the cabin.

IN just three minutes' time, a newly-developed pickup camper—called the Cee Camp—converts into a catamaran houseboat that sleeps two or three persons.

The intriguing amphib was developed by N. C. Copeland, a retired Navy officer with an inventive turn of mind. A conventional camping body when installed on an 8-ft. pickup, it becomes a boat when its twin pontoons are lowered and it is backed down to the water and floated off the truck.

Powered by a 40-hp outboard motor, the

craft handles like a true catamaran. Acceleration is rapid, since the smooth pontoon hulls offer little water resistance. Up to about 15 mph the pontoons draw only 3 in. of water. At about 18 mph, the pontoon noses start to come up and soon the craft is planing at a top speed of 30 mph. Maneuverability is excellent, cornering is flat and the spray thrown is less than on many cruisers or outboards.

The "Cat" Hulls are about 12 ft. long, 2½ ft. wide and 14 in. deep. There are five bulkheads in each hull, providing seven water-tight flotation chambers. The hull framing is of fir, braced inside with steel and covered with quarter-inch marine plywood.



Here a pontoon is locked in the "down" position by pushing a retaining pin through the boom and its support channel. The same pin (pushed through a different hole) locks the pontoon in the "up" position for on-road travel.

Without passengers, the craft floats in only 2 in. of water. Here it is easily pushed out of the pickup's box after the truck has backed into the water. The guide rail along the wall of the cabin above the side window facilitates walking on the pontoon for fishing or swimming.

The bottoms are fiber-glassed, as are the sides up to 4 in. Together, the two hulls weigh 240 lbs. and account for a good chunk of the total 800-lb. weight.

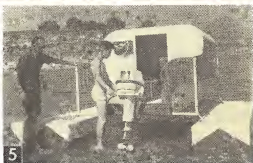
Quarter-inch marine plywood is used for the cabin, too, and its sides are trimmed with ribbon grain mahogany. The roof is insulated with a half-inch layer of glass mat and is covered with a textured marine plastic.

Inside, the cabin measures 6 ft., 2 in. in both length and width and is 4 ft., 9½ in. high. The afterdeck, which looks much like that of the average small outboard cruiser, is 46 in. long from the cabin door to the transom. The floor is 2 in. thick and is divided into nine chambers for additional flotation.

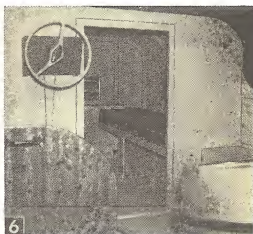
"Sea Legs" Are the Key to the craft's amphibious ability. The "legs"—or pontoon booms—are hinged so that the pontoons can be stored atop the cabin for on-road travel, then lowered easily for water use (Fig. 2).

The L-shape booms are made of tough aluminum aircraft tubing, with the short end of the L fastened securely to the pontoon. The top of each L is hinged-fastened to a steel-support channel bolted to a corner of the cabin. By inserting spring tension retaining clips through holes in the channel and the boom, the boom can be locked in either the "down" or the "up" position (Fig. 3).

The Cee Camps are manufactured by Copeland Engineering Enterprises, North Hollywood, Calif. The model shown in the photos sleeps two persons and sells for \$1,385, less the outboard motor. Included in the price are two 6-ft.-long bunks and a folding table hinged to the front of the cabin. A three-sleeper sells for \$1,495, and Copeland plans to sell (for \$235) a trailer which can be used to carry the craft if you don't have a pickup. (Incidentally, the Cee Camp has been rated as a "boat" by the Coast Guard, which means it is not subject to the Federal Excise Tax recently slapped on pickup campers of the land-only type.) Accessories available include a two-burner butane stove and tank, a compact sink unit, ice box, closet, riding lights, tackle cleats and pilot's seat.



With the craft afloat, the motor can be lowered into the water from its trailing position. The Cee Camp shown here has a left-hand helm, but right-hand is also available. The steering harness used is exactly like that in an outboard cruiser.



View of cabin shows one of the bunks, with the hinged table lowered. Windows on the sides and front can be opened for ventilation. The cabin's accordion-like folding door has been removed.



Drawing shows the nuclear-powered salt water conversion plant to be built near San Diego. The uranium-burning reactor and the heat-exchanger boiler are housed in the large structure in the background. The salt water bailers and the larger distillation units are in the foreground. Between them, in the small, silo-like building, salt crystals are added to the incoming salt water to prevent scale formation. The plant's operation is shown in Fig. 3.

Drawing courtesy of the Fluor Corp., Ltd., Los Angeles, Calif.

De-Salting Sea Water with A-Power

Atomic power is being harnessed to solve the growing water shortage. Here's how it will help make sea water fresh

By JEAN CORCORAN

DURING the past decade or so, salt water has been frozen and heated, shocked and spun, to convert it to fresh water to supplement our fast-shrinking supply.

Unfortunately, the cost of the power needed to operate the conversion processes has been far too high to make conversion practical.

Now, though, it appears that we have licked this problem by using a nuclear reactor method that produces both fresh water and electric power.

Working in company with the multi-stage flash distillation process of de-salting, the reactor will produce fresh water at about 42¢ per thousand gallons. Subtract from this the income from the sale of the electricity, and

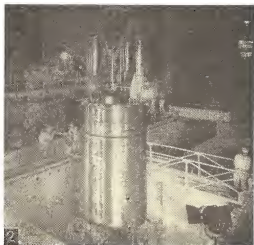
the final cost of the converted water will be brought down to about 20¢ for each thousand gallons.

How does that figure compare to what the consumer pays today for fresh water pumped from the ground?

It looks very good indeed. The average household pays from 20¢ to 60¢ a thousand gallons for its water, according to the U. S. Department of the Interior.

That is, it pays that much when the water is available. Some communities in Texas, for example, have so little drinking water they pay 50¢ for a gallon jug of it.

St. Louis can find almost no ground water



A nuclear core—or fuel charge—like this one will power the San Diego salt water conversion plant. The fuel, in a stainless steel container, is here being lowered into a reactor at Shippingport, Pa. At the San Diego plant, the fuel will be in an aluminum container. Dressed in white, the technicians give the appearance of a hospital operating room; absolute cleanliness is necessary to prevent any foreign particles from entering the core.

Photo from Duquesne Light Co.

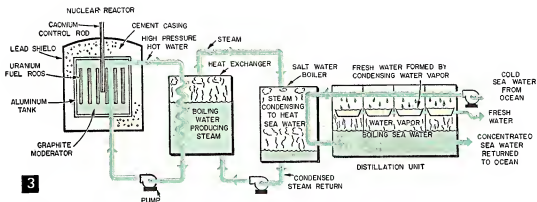


Diagram details how the powerful nuclear reactor is used with the multi-stage flash distillation process. The reactor, heat exchanger and salt water boiler all help heat the incoming salt water. The cold sea water from the ocean travels through pipes to the salt water boiler, where condensing steam heats it. The heated sea water then passes into the first vacuum chamber of the distillation unit, where reduced pressure causes it to boil. Water vapor rises, leaving brine behind. This vapor hits the cold sea water pipes and condenses, producing fresh water. Remaining brine goes through more vacuum chambers, with more fresh water produced in each one, until all the heat has been removed from the water and the brine is returned to the ocean.

below the city, and Atlantic City must dig 10 ft. deeper for its water than it did 10 years ago.

In all, the United States uses about 240 billion gallons of water every day, and the U. S. Geological Survey says that in just 20 years the total will rise to 600 billion gallons.

At the end of those 20 years, many cities and towns will have to get all or part of their fresh water by converting sea or brackish water, predicts Fred G. Aandahl, Assistant Secretary of the Interior. Thus, the nuclear reactor conversion method represents a crucial breakthrough.

The process was set up late last year, when the U. S. Office of Saline Water and the Atomic Energy Commission signed an agreement under which the AEC will operate the uranium-burning reactor in cooperation with the Interior Department's saline conversion plant to be built near San Diego, Calif. (Fig. 1). The first stage, the conversion plant, will be in operation by January, 1962, with the electric power plant scheduled for later.

Key to Low-Cost Conversion at the plant is the tremendous power that can be obtained from the reactor. One pound of uranium fuel, for instance, can do the work of 5 million pounds of coal or of 5 billion BTUs of natural gas.

How can uranium produce such energy?

How much water does it take?

It is not hard to see why we are running out of fresh water. Look how much of the precious liquid is used in these few ways:

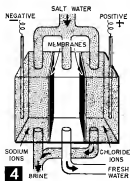
- 15 gallons for a three-minute shower.
- 3 million gallons a day to air condition a large building.
- 65,000 gallons to produce a ton of highly finished steel.
- 2½ gallons to make a phonograph record.

In essence, the process is a simple one, much like spontaneous combustion. Sawdust, for example, accumulates heat until it reaches kindling temperature and ignites itself.

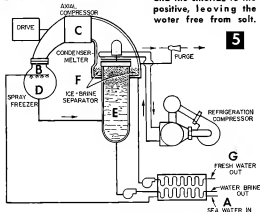
The requirement to start the "spontaneous combustion" of uranium fuel (U-235) is almost as simple. However, in this case you need a critical mass rather than a critical temperature. What this means is that "spontaneous combustion" of the atomic fuel takes place as soon as you assemble a lump of a certain weight (somewhere between 25 and 100 lbs.; the AEC is not saying exactly how much). That is all there is to it: a lump of U-235 somewhere in that weight range will fission and release an explosive force equal to 20,000 tons of TNT.

Now, what keeps the fuel burning? The answer in technical terms is "a self-multiplying chain reaction with neutrons." In everyday language, this means that when one uranium atom explodes, or splits, it not only releases great power but, as a result of the explosion, two or three neutrons fly away at great speed. These hit other uranium atoms, splitting them. This process continues, and soon billions upon billions of uranium atoms are splitting one another, producing fantastic amounts of heat—up to some 90 million degrees Fahrenheit.

For practical use, the U-235 is separated



The electric membrane process for converting sea water to fresh is simple in operation, but more costly than the reactor method because of power requirements. It is based on the fact that salt consists of sodium and chloride. When salt water is run between two electrically charged poles, the sodium ions move through the membrane to the negative pole and the chloride to the positive, leaving the water free from salt.



Freeze-evaporation method is based on the fact that when water freezes, most of the mineral content separates from the ice crystals. Sea water is pumped in at (A) and goes to vacuum chamber (B), where reduced pressure causes some of it to vaporize up into axial compressor. The water that does not vaporize is lowered into freezer (D) and frozen to 24°F. A sprayer then freezes the ice of salt by on ice-whirling operation called counter-current washing. The washed ice and brine move to the ice-brine separator (E). Brine is carried down and out of the plant, while ice crystals go up to the condenser-melter (F), where remaining brine is purged off. The pure ice crystals then are melted by heat from the refrigeration and axial compressors and carried off as fresh water (G).

carefully into safe, uncritical masses before being put into the reactor in the form of rods. As these uranium rods are inserted, one by one, they build up weight inside the reactor. Finally, critical mass is attained, and fission begins to take place.

The uranium rods are suspended in graphite, which acts as a moderator to slow down fast neutrons. An aluminum tank surrounds the graphite and reflects escaping neutrons back into the fission process. In the center of the reactor are cadmium control rods, which are lowered to absorb neutrons and retard the reaction—or raised to speed it.

Water is circulated in pipes through the core of the reactor, to act as a coolant. If this water is allowed to become very hot—by adjustment of the control rods—it can be

used to generate steam for turbines and the production of electric power.

At first, while just the initial stage of the plant is in operation, the heat from the reactor will be used only to boil sea water and convert it to fresh (Fig. 3).

Converting Salt Water. As mentioned, heat is removed from the reactor through the coolant pipes. This water, which becomes very hot, is prevented from boiling by keeping it under high pressure.

The hot water is pumped through pipes into a chamber called a heat exchanger. Water in the heat exchanger is not kept under pressure, so it boils. This boiling produces steam, which is then passed through more pipes to a heater containing sea water. The steam condenses, heating the sea water, which then passes on into the multistage flash distillation chamber.

The distillation process is a standard one. The heated sea water is introduced into the first chamber of the large distillation unit, where a pressure just below the boiling point of the hot brine is maintained. When the brine enters this chamber, the reduced pressure causes part of the liquid to immediately boil—or flash—into vapor. This vapor hits the cold pipes carrying sea water into the plant from the ocean, and it condenses—producing fresh water. The remaining brine, meanwhile, passes through a series of similar chambers at successively lower pressures, where the flash process is repeated at progressively lower temperatures. In each chamber the flash vapor condenses and forms more fresh water. Finally, all the heat has been removed from the salt water, which is then sent back into the ocean.

Scale Problem Solved. Another stumbling block that has been overcome besides the power cost is the formation of scale in the pipes. In previous systems, the pipe-clogging scale formed when salt was precipitated out of solution.

But it has been found, surprisingly enough, that adding salt crystals to the raw, incoming sea water will solve this problem.

The crystals flow through the pipes, with the sea water, and the saline water deposits its own salt on them instead of on the walls of the evaporator or the pipes.

The plant will be able to produce 1 million gallons of fresh water a day, at the initial cost of 42¢ a thousand, with the cost dropping to 20¢ once sale of electric power begins. In contrast, another conversion method under study—the membrane process—will cost at least 60¢ per thousand (Fig. 4), while \$1 per thousand is the best that can be done so far with an experimental freezing process (Fig. 5).

It appears that nuclear fuel can not be beat as the power key to fresh water shortages.

Lunar Explorers May Ride in Squirrel Cage

SPACE explorers may roll around the moon's surface in a squirrel cage-type vehicle much like this one.

Once a space craft lands on the moon, the collapsible *Moon Sac* would be inflated, then equipped to house and provide for explorations by a two-man team. The inflating gas would also serve as an atmosphere and allow natural breathing, speaking and eating.

The lightweight, barbell-shaped vehicle was designed by Scully-Anthony Corp., a division of Scully-Jones Co., Chicago, Ill.



Cutaway drawing of proposed moon vehicle shows how two-man team would provide mobile power through treadmill-type foot operation. Hand ropes would help men maintain balance. To turn the *Moon Sac*, one man would keep walking, while his partner remains stationary.

Electronic Leash Shocks Sense Into Fido

AN electronic device, called *Electro-Leash*, can literally shock sense into your pooch—shaping him into a show dog or simply teaching him to behave around the house.

The obedience trainer consists of a palm-sized, transistorized pulse generator, 50 feet of wire which also serves as the leash and a dog collar with two tiny electrodes.

Electro-Leash in hand, you don't have to yell at your pooch or brandish a whip. If he bee-lines for the sofa or starts to chase a car, you merely press a button—and he's stopped short by a harmless electric shock.

The device's inventor, Gail Lee—of Tucson, Arizona's, Lee Brothers, who have bred and trained some of the U. S.'s finest dogs—says that psychologically, electronic obedience is the best thing that ever happened to a dog—and its master.

"With whipping," explains Gail, "your dog associates his hurt with you, his master. But a quick shock out of the blue is anonymous and carries no stigma to mar master-canine relations."

The Lees have been pulse-teaching their dogs for the past several years.

Redesigned and built by industrial engineer Max Gottschalk, *Electro-Leash* uses a 22-volt battery to slow-charge a capacitor through a 5000-ohm resistor. Press the control button, and the built-up voltage discharges as an inductive kick-pulse through a transformer.

Gottschalk's Godesca Company staff in

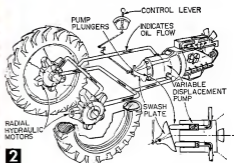
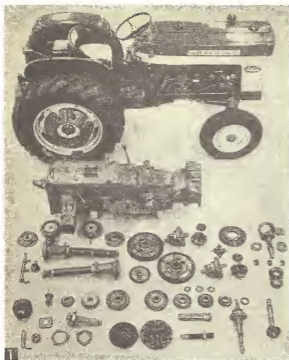


Dachshund looks at pulse generator in hand of its trainer. Around its neck is special collar with two small electrodes to apply harmless shock. The device costs about \$30.

Tucson spent days running resistance tests on more than 40 breeds of dogs before coming up with a just-right pulse that would sting but not harm. They found that dog skin resistance varies between 5000 and 18,000 ohms, the average being about 10,000.

Trainers, quick to adopt the electronic teaching method, report they can teach show dogs to sit, stand and heel in less than 15 minutes. And without once raising their voices—or hands—in anger.—JAMES JOSEPH.

Experimental Tractor Has No Gears



The experimental system has three major parts: A pair of radial hydraulic motors and a variable displacement pump (coupled directly to the engine) which furnishes pressure energy to the system. By changing the angle of the swashplate, the control lever can lengthen or shorten the strokes of nine plungers, thus increasing or cutting tractor speed. With the lever in neutral, the swashplate stops action of the plungers, and the oil in the system serves as a brake on the wheels.

This International 340 utility tractor once contained all the parts lying beside it. An experimental hydrostatic transmission now replaces the gears, rear axle, brakes and clutch and the main frame casing that held them.

INSTEAD of gears, oil under high pressure operates the transmission of this experimental tractor.

In its hydrostatic transmission system, the freely flowing oil transmits power by acting on pistons in radial hydraulic motors in the driving wheels (Fig. 2). The pistons act on an eccentric which serves as a crankshaft, converting hydraulic power to torque.

Because the oil is nearly incompressible, it makes for a positive connection between the engine and the wheels, according to re-

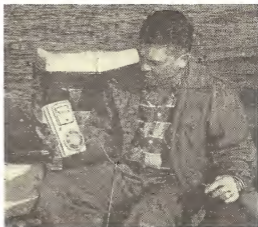
searchers who developed the tractor at International Harvester Co., Chicago, Ill. Unlike hydrokinetic drives like those in cars, the tractor's drive has no slippage between engine and wheels, thus its response to controls is immediate.

Once the tractor engine is started, a single lever near the steering wheel starts forward or reverse motion and controls speed. The change from forward to reverse requires a corresponding movement of the lever, while moving it to neutral brakes the tractor.

Thermometer Aids Scientific Fishing

THIS underwater thermometer will help anglers spot the waters where fish usually are found.

It consists of a sensor attached by 40 ft. of line to a plastic case containing the temperature dial. To operate it, you turn on the switch, lower the sensor overboard (there are foot markings on the line) and watch the dial until the temperature you are looking for appears. Large-mouth bass, for example, prefer 70° water. Called the *Aqua-Temp*, the rig is made by Thermo Products Co., Inc., Milwaukee, Wis., and sells for \$19.50.





Amphicar Travels on Water or Land

PART boat and part car, this German import recently made its American debut. Dubbed the *Amphicar*, it has a self-supporting floating body—162 in. long overall, on an 80-in. wheelbase.

Its 4-cylinder 39-hp motor is water cooled and has four fully synchronized forward speeds and one reverse for on-land operation. For on-water drive, a switch operates twin propellers in the rear at forward or reverse speed.

The manufacturer says it will give 32 mpg on land and use about 2 gals. per hour on the water. The importer is Amphicar Corporation of America, New York, N. Y.



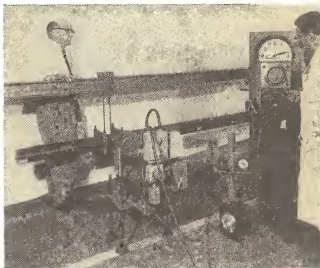
Resonant Bending Cuts Pipe Test Time

YEARS of fatigue are compressed into minutes in a new pipe-testing method called resonant bending.

In this method, a length of pipe set to vibrating in its natural resonance frequency literally shakes itself until it cracks from fatigue.

Pipe fittings with steel walls a half-inch thick can be vibrated to the point of failure in less than half an hour, according to the Tube Turns Division of Chemetron Corp., Louisville, Ky., the company that developed the procedure. This 30 minutes simulates the stresses and strains found in years of use in industrial plants and cross-country pipelines.

The new method is five to six times faster than techniques which use mechanical means or water pressure to bend the pipes, according to research engineers at Chemetron.



Research engineers here are inducing vibration in a 4-in. carbon steel pipe at about 4,300 cycles per minute. Pressure inside pipe decreases when fatigue crack occurs, automatically stopping experiment and permitting measurement of cycles up to failure.



Pivot-Top Desk a Modern Space Saver

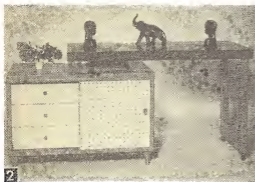


THREE forms of hardboard on simple framing combine to make up this attractive and economical pivot-top desk which can extend in any direction from its cabinet base as in Fig. 1, expand its overall length (Fig. 2) or swing around it completely when minimum space is desired as in Fig. 3.

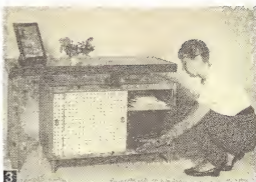
The design makes lavish use of $\frac{1}{4}$ -in. tempered hardboard, yet with economy in mind. You can cut all the pieces from one 4 x 8-ft. sheet if you follow the pattern outlined in Fig. 4. Small stock pieces given in the Materials List are ample for the perforated hardboard sliding doors and storage compartment sidewalls, as well as for the $\frac{3}{16}$ -in. hardboard which is adaptable for a simplified method of drawer construction.

Be sure to order the 2% and 1% $\frac{1}{2}$ -in. lumber to length specified in the Materials List—or double it—for more economical cutting. And plan to rip all wider pieces of lumber from a 7 $\frac{1}{2}$ -ft. length of 1 x 12-in. (nominal size) pine. The little

Desk top offers a 48-in. wide work surface and swings to any position around cabinet. In this setting, slightly more than a right angle, girl can slide left-hand door and pull out either drawer without leaving or moving her chair.



Extended to full 62-in. length, the pivot-top desk is an appropriate setting for decorative displays and becomes an effective room divider.



When not in use, desk can be swung completely over cabinet to save space, yet still serve as attractive furniture piece. Note adequate storage.

scrap remaining will come in handy if you spoil one of the narrower pieces.

Base Cabinet Assembly. Make frames for the cabinet top, base, center divider and both ends according to dimensions given in Fig. 5A, using 2½-in.-wide stock for bottom front rail, top and bottom center crosspieces and the three front posts, and 1½-in. boards for all other pieces. Square each joint, clamp and secure with corrugated fasteners.

Attach end frames to side edges of bottom frame with 8d finishing nails. To fasten center divider in position, turn over assembly and nail through bottom of crosspiece. Right the assembly again, place top frame over divider frame, square with end pieces and nail. Plumb the divider and nail top to it. Locate drawer guides as in Fig. 5B and tack in position temporarily, ends flush with outside edge of rear posts.

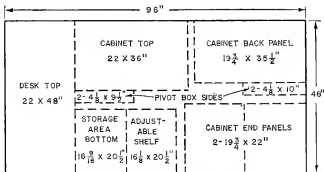
To install legs, drill ¼-in. dia. holes through the base frame 2 in. from each edge at corners, countersink and drive T-nuts in place as in Fig. 5C. Screw legs up tight. If you wish to turn the legs in your lathe, follow dimensions in Fig. 5C. If you buy legs with brackets for undercabinet attachment instead of hanger bolts, be sure that overall length of bracket and leg is 4 in.

Applying the Hardboard. Saw a 22½ x 48-in. piece off an end of the 4 x 8-ft. tempered hardboard for the desk top and put it aside. Now turn back of cabinet up, place one end of the remaining sheet on the back in position shown in Fig. 4, mark off two remaining sides and saw off piece to cover framing. Glue and brad piece in place, smooth side out. Smooth any rough edges flush to frame.

It's best to place hardboard against the work, marking and cutting each piece as you go, in the same position shown for it in Fig. 4. With a different layout, you may need to buy more hardboard to complete your cutouts. Marking from the work instead of trusting to the exact sizes in the plan will give a better fit if there is any deviation in the framing.

Mark pieces to cover end frames plus edge of back panel, cut and install as above. Sand edges flush. Turn cabinet up again, mark off, cut and install top, and smooth edges. Cut panel for storage area bottom, aligning front with outside edge of center post as in Fig. 5A. Glue and fasten with brads.

To make the pivot box (Fig. 5D), cut two 9½ x 9½-in. blocks, clamp together to center-bore a ½-in. hole. Out of the remaining tempered hardboard pieces, cut sides to dimensions given in Fig. 5D, then assemble box with glue and brads. Glue box to cabinet top over storage area, 6 in. from front, side and



GUIDE TO MAKE ALL ½" TEMPERED HARDBOARD CUTS FROM ONE 4 X 8' SHEET

MATERIALS LIST—PIVOT-TOP DESK

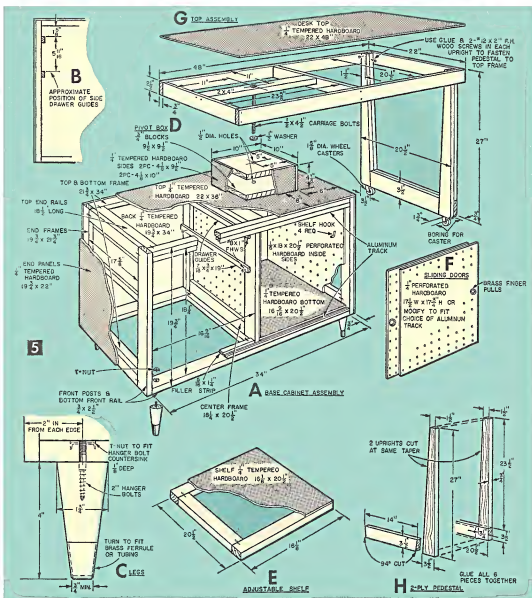
No. Req.	Size and Description
1 pc	¾ x 11½" x 7½" (nominal 1 x 12") pine (rip out drawer fronts, pivot box top and bottom, 6 pedestal pieces)
5 pcs	¾ x 2½" x 5" (nominal 1 x 3") pine (cabinet, desk top, shelf framing)
6 pcs	¾ x 1½" x 6" (nominal 1 x 2") pine (cabinet desk top framing)
1 pc	2 x 4 x 24" (for desk top frame)
1 pc	¾ x ¾ x 78" strip (for drawer guides)
1 pc	¾ x 1¼ x 16½" strip (for filler strip)
1 pc	¼" x 4 x 8" tempered hardboard (Masonite) (see Fig. 4)
1 pc	¾ x 4 x 5" hardboard (Plywood) (for drawer assembly)
1 pc	¼ x 18 x 36" perforated hardboard (Peg-Board) (for doors)
1 pc	¼ x 24 x 36" perforated hardboard (for compartment)
1 pc	3", 2-channel shallow aluminum track for ¼" doors (Reynolds)
1 pc	3", 2-channel deep aluminum track for ¼" doors (Reynolds)
4	4" tapered legs with hanger bolts and T-nuts or brackets (about \$3.50 set at many lumber dealers, hardware stores)
2	1½"-dia. wheel casters (ball-bearing type)
3	brass knobs (drawers)
4	brass flush finger pulls (doors)
4	shelf hooks (perforated hardboard)
1	½ x 4½ carriage bolt with 2 washers, lock washer, nut
4	#12 x 2½" fh screws (pedestal)
8	#8 x 1" fh screws (drawer guides)
misc	corrugated fasteners, 8d finishing nails, ¾" and ¾" brads, wood glue or contact cement, putty, paint or lacquer

rear edges of the top. Brad from underneath.

Divide the ¼-in. perforated hardboard sheet into 18 x 20½-in. panels with holes in alignment, then glue and brad to each side of compartment as in Fig. 5A. Make the adjustable shelf as shown in Fig. 5E and place on shelf hooks installed in the perforated liners. If too tight, sand shelf side edges slightly for a snug fit.

Install the deep two-channel aluminum track to underside of top frame and the shallow track on bottom frame, placing both pieces against edge of the center post as in Fig. 5A. Glue and brad filler strip to bottom frame against inside of track in drawer section of cabinet. Cut door panels from ¼-in. perforated hardboard to size given in Fig. 5F so that hole patterns align and edge margins are similar. Install brass door pulls. Insert a panel in each top channel and drop into place in lower track.

Desk Top Assembly. Cut pieces for the top frame out of 2½-in. stock to sizes given in Fig. 5G, square ends and secure with two 8d finishing nails at each joint. Nail in a 2 x 4



crosspiece in that part of the frame intended to go over the pivot box, drill a $\frac{1}{2}$ -in. dia. hole through exact center of crosspiece and countersink for head of a carriage bolt, as in Fig. 5G.

To make the pedestal, rip out of wide stock a pair of 27-in. legs and another pair 23½ in. long, tapering the widths to dimensions given in Fig. 5H. Rip a 3½-in. wide piece 20½ in. long and another 14 in. long, angling the latter cuts 94° as in Fig. 5H. Glue the six pieces as shown in Fig. 5G and H and sand edges flush. Drill holes to fit casters in bottom of base, centered 1¼ in. from each end and in-

stall casters.

Now you can attach the pedestal to the top frame. Place leg ends against inside corners flush with top as in Fig. 5G, and fasten with #12 x 2-in. fh (flathead) screws, one into each adjoining rail.

Insert a ½ x 4½-in. carriage bolt through the frame's 2 x 4 crosspiece and add a ⅝-in. thick washer for a spacer as in Fig. 5D and G. Attach top frame to cabinet by passing bolt through pivot box and cabinet top, slip on a washer and lock-washer, then tighten with a nut. Glue and brad previously cut tempered hardboard panel, smooth side up, to top of

frame. Carefully sand any overhang flush to frame.

Drawer Construction. Except for the fronts, all drawer parts are $\frac{3}{8}$ -in. hardboard used two-ply for sides and back, single-ply for bottoms and file drawer partition.

Cut two pieces of the thin hardboard for each side and back of each drawer to dimensions in Fig. 6. Note that one ply of back is $\frac{3}{8}$ in. longer than the other. Put matching pieces together, smooth faces out, glue and nail with $\frac{3}{8}$ -in. brads at a slight angle so points will not break through the two-ply. Clamp until dry. Cut single-ply drawer bottoms and the partition out of the thin hardboard sheet to sizes in Fig. 6. Cut the fronts out of wide pine stock to sizes shown.

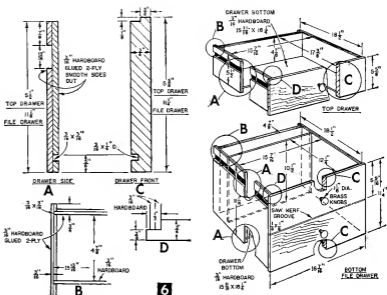
Mortise side pieces for drawer guides and bottom panel as in A-A of Fig. 6, for back panel as in B-B and for file drawer partition as in B-B. Rabbet the top and mortise near the bottom of each front panel as in C-C, then mortise side edges as in D-D. For decorative effect, saw a kerf across the larger drawer front as in Fig. 6.

If you prefer, you can make all these mortises and rabbets with straight cuts through the single-ply hardboard, but this involves extremely accurate measurement and cutting to assure that each piece will fall in place just right for gluing.

To assemble, glue all pieces well at joints, then apply back to a side, slip drawer bottom in grooves, attach other side and finally, the front panel. For added strength, brad sides to front panel at rabbets and, from underneath, brad through panel and drawer bottom. Slightly bevel side edges of partition and slide it into place in file drawer.

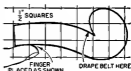
Place completed drawers in cabinet and adjust drawer guide position. Screw guides in place and install knobs.

Set all exposed nail heads, putty the holes, sand surfaces smooth and your pivot-top desk is ready for a wide selection of finishes. We chose a dramatic three-color treatment; staining the desk frame to blend with the hardboard and then coating the whole top with lacquer; applying a semi-gloss, medium-grey enamel to cabinet and pedestal and, for contrast, touching up the drawers and doors in a flat off-white.



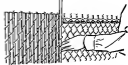
Will It Balance?

- Cut this pipe-like form out of $\frac{5}{8}$ -in. soft pine and sand away the saw marks. Your friends will say it is impossible to balance it on the end of your finger as shown, and they will be partly right. But after they have been properly baffled, take your belt and loop it over the pipe. The center of gravity thus shifted produces a fine optical illusion of impossibility, but the pipe will balance. Try it! —ELEANORE ENGELS.



Fence Cover-Up

- You can add privacy to a woven wire fence or screen out unsightly areas, yet permit air and sunlight to enter, by inserting 1-in.-wide strips of Masonite $\frac{1}{8}$ in. Tempered Presdwood through the openings. The weather-resistant slats needn't be painted.



DON'T MISS AN ISSUE—

The next issue of **SCIENCE and MECHANICS** will be on the newsstands only 30 days. It goes on sale August 30th. Better buy your copy as soon as you see it—the way they've been selling lately, we don't have back copies available, in case you miss one.



2 Pack aluminum material into groove, let dry, then sand for smooth inlay.

Brushed-on metal finish makes conversation piece of table lamp built from scrap wood.

Alumicrafting New Faces on Shop Projects

By R. J. De CRISTOFORO

YOU can apply a dramatic metallic finish to wood, metal, glass, plastic, leather, cloth—you name it—as easily as you can paint a board.

Cold coatings such as Plastic Aluminum used here are ready to use in squeeze-out tubes or bulk containers you can buy in most hardware stores. You can color the material and dilute or thicken it to provide several other finishes. Here are some "alumicrafting" possibilities:

Making a Lamp. The structure in Fig. 1 was made of scrap wood and treated with a green-tinted, aluminum



finish. To duplicate it, use any wood handy which can be sized to dimensions indicated in Fig. 7. Be sure it is dry. Any joint separation after assembly will show up as a crack in the finish. You'll find the brass fittings and completely assembled harp (Materials List) in the electrical supply department of most hardware and department stores. You can buy the parts to make the shade, but we bought ours at a sale as cheap as the cost of the raw materials.

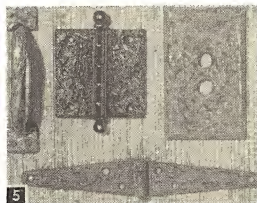
Put parts 1 and 2 together first, using plenty of glue and $1\frac{1}{2}$ in. finishing nails. Part 3 can be any block of wood; it's there to add weight. Before nailing it in place, drill a $\frac{3}{8}$ -in. center hole for the lamp cord.

Next, cut parts 4 and 5 and drill $\frac{3}{8}$ -in. holes through the center of each. Glue mating surfaces and assemble by passing the threaded tube

Light buffing adds luster to baby shoes, metallized without electroplating.



4 For striking 3-D effect, apply directly from tube and spread with knife or spatula.



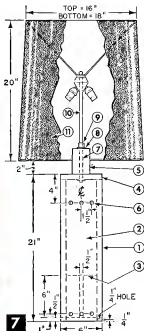
5 "Customizing" plain hardware.

through the hole and secure with upper and lower nuts. Be sure that $\frac{1}{2}$ in. of tube projects above top nut.

Glue assembly to pedestal and nail. Set all nails, fill holes, attach upholstery



6 Diluted plastic aluminum brushed against top edges flows to simulate candle drippings.



tacks and you are ready for the aluminum finish.

Squeeze out $\frac{1}{4}$ tube of Plastic Aluminum into glass dish or ash tray. Sprinkle with dry bronzing powder (we used green) and blend well with spatula until aluminum colors to tone desired. Add acetone by spoonful and keep mixing until aluminum is of creamy consistency. Apply with a fairly stiff $\frac{1}{2}$ -in. brush. If mixture begins to harden as you work, mix in a little more acetone.

Candle-Drip Effect. When the initial application has dried 10 hours, treat the pedestal top with the thin aluminum mix described later for use with baby shoes. Pick up a liberal amount of this with a smooth artist's brush and squeeze it off along the pedestal's top edges (Fig. 6). The liquid will run part way down the sides, then harden to resemble candle drippings.

After 24 hours, rub the entire lamp base with steel wool. You can burnish the whole surface or just hit the high spots. The latter is most effective when the lamp is lit.

Metallizing Baby Shoes. Here's a very effective metallic finish without electroplating. Prepare shoes by cleaning with soap and water, drying and, if very smooth, scuffing slightly with sandpaper. Tie laces tightly and secure them with tiny pieces of tape. Stuff shoes with wads of newspaper, but not so tightly that you remove the wrinkles that add much charm to the final appearance.

Place about 4 tablespoonfuls of acetone in a glass dish. Squeeze about $\frac{1}{4}$ tube of the aluminum into acetone. Blend with spatula until aluminum absorbs all liquid. Pour another spoonful of acetone to cover the mixture, but do not mix in.

Use a soft bristle brush to paint successive thin coats on shoes (Fig. 8). The acetone film over this thin mixture assures a smooth, quick-drying application so you can work from shoe to shoe and build up a thick coat quickly. If you want color, mix it in with the aluminum before adding acetone.

After 4 or 5 coats, let the shoes dry at least 24 hours. If leather is not stiff and hard, add a few more

MATERIALS LIST—LAMP

Key	No.	Req.	Size and Description
1	2	pcs	$\frac{3}{8}$ x $4\frac{1}{2}$ x $20\frac{1}{4}$ " pine
2	2	pcs	$\frac{3}{8}$ x 6 x $20\frac{1}{4}$ " pine
3	1	pc	$4\frac{1}{2}$ x $4\frac{1}{2}$ x 6 " pine (or fir)
4	1	pc	$\frac{3}{8}$ x 6 x 6 " pine
5	1	pc	$1\frac{1}{4}$ x $2\frac{1}{2}$ x $3\frac{3}{4}$ " pine
6	24		rh (roundhead) upholstery tacks
7	1		$\frac{3}{8}$ x $5\frac{1}{2}$ " threaded brass tube
8	2		brass nuts (for tube)
9	1		brass coupling
10	1		2-socket harp
11	1		shade

coats. When dry, buff lightly with red jeweler's rouge (Fig. 3), clean with soap-impregnated steel wool, then buff again without a polishing agent.

Making Costume Jewelry. The finish for shoes is equally appropriate for creating costume jewelry by coating leaves and similar delicate items (Fig. 9). If leaves are dry, they will be easier to handle.

Coat one side of a leaf first and let it dry; then do the other side. Build up to a fairly heavy coat with several thin applications to avoid hiding texture and veins. It can then be used as a pin, pendant or earring merely by attaching a finding on the back side, using some aluminum from the tube as an adhesive.

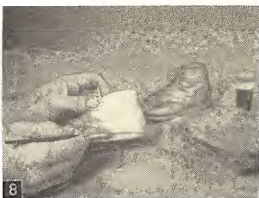
For a Real Heavy Look such as that appearing on the box and candle holder in Fig. 4, squeeze the plastic metal from tube directly onto the project. Spread with spatula, dipping it occasionally into acetone. Don't smooth the coating; layers should vary from $\frac{1}{32}$ to about $\frac{1}{16}$ in. Let dry 24 hours, then sand lightly for highlighted effect.

For the antique finish on cover of box in Fig. 4, follow this procedure but before sanding, dip cloth in acetone and then in lamp black. Rub the black over aluminum coating, letting it pile up in crevices and depressions. Sand lightly. You can substitute dry bronzing powder in color desired for the lamp black.

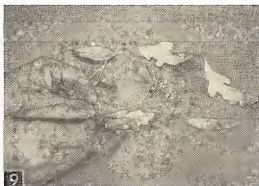
Customizing Hardware. You can convert old-style door and cabinet hardware into expensive looking, custom designs with any of the aluminum finishes (Fig. 5). Treat screw or bolt heads the same way. Since the material is weatherproof, you can use it on outdoor hardware.

Simple Inlays. Working with plastic aluminum, you can get a really smooth metal strip on wood lathe projects such as the bowl in Fig. 2.

Turn the bowl like any conventional lathe project (Fig. 10A). When completely finished and sanded, turn in a dovetail groove for the metal band (Fig. 10B). With lathe still, apply aluminum directly from tube into the groove (Fig. 10C). Press in firmly with spatula or screwdriver tip until groove is half filled. Leave surface rough, let dry 24 hours and then fill in remaining space.



Several thin applications build up thick coat without destroying detail.



Coating leaves is quick, economical way to make attractive costume jewelry.

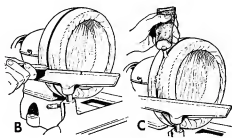
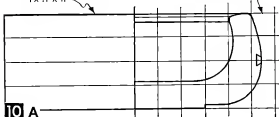
After another 24 hours, sand to remove excess material as bowl turns in lathe. Stop lathe when inlay is flush with surface and turn bowl by hand to check.

Small holes and pits are easily fixed with spot applications of the aluminum. But you can add much charm to the inlay by allowing some holes to remain.

Caution: You can buff these finishes as you would any metal, but go lightly when coating is thin, such as leaves, or you may remove the coating. Use steel wool for highlighted effects and a wire brush for a satin finish. If desirable, you can protect these finishes with satin-finish varnish or lacquer.

4 PIECES BIRCH OR MAPLE
1 X 11 X 11"

1" SQUARES



Pop-Up Camper



**Build it yourself for \$100,
a savings of \$500 over
a similar factory-built job**

By HOWARD ZIEGLER

**Craft Print
Project No. 309**



BUILT with a roof that can be quickly raised and lowered, this pickup camper will give you the stand-up headroom of a large, heavy camper. Yet it still retains the driving advantages of the small camper which folds down for traveling.

Because of its light weight and sturdy construction, you can take to the rough off-beat roads without special overload springs, heavy-duty tires or a pickup truck with a big engine. The collapsible roof feature reduces gas-wasting wind resistance, and sway bracing isn't needed for cornering or bucking a strong wind.

This being the third pickup camper body I have built and used in the past 15 years, I tried to incorporate all of the good and none of the bad features of the too large or too small pickup campers. For example, we have two good-size bunks (Fig. 4) with ample stand-up dressing room; a galley with ice box, stove and food storage cabinet (Fig. 5); a knock-down table which allows us to eat a meal indoors during cool or rainy weather; a cabinet to keep our clothes clean when traveling and a large bedding storage chest that serves as a seat.

If you care to line the storage chest with sheet metal and provide a drain through the camper floor as we did, you'll have a private

bathtub which is a luxury when roughing it far from civilization.

Although we built this camper body for our 1953 Ford pickup truck, you can alter the size of the parts to suit the make and model pickup truck you have. Follow the general assembly procedure but measure and cut each part as you assemble it, taking the dimensions directly from your pickup truck body.

Making the Camper Body. Start by checking the basic dimensions of the framework (Fig. 2). Note that the whole structure is built around four studs (Fig. 2A) which fit in the pickup body post sockets. First, make the studs from 2 x 4-in. stock (actually 1½ x 3½ in.), notching the lower 12 in. to fit the body socket and to place the face of the stud flush with the outside surface of the truck body ends. The lower ends of the studs should make a snug fit in the sockets. Don't make them so tight that you have to drive them in. Notch the upper ends of the studs to receive the 1½ x 1½-in. plates.

Next cut the front panel to size as in Fig. 2C. Location of the window opening will depend on location of the window in the pickup cab so don't cut the opening until the panel has been temporarily clamped on the studs. Use a level to get the studs plumb and mark the stud locations on the panel. Then

remove the panel and studs from the body and fasten panel to studs with #10 x 1 3/4-in. fh screws spaced 4 in. apart. Saw the window opening before you return the panel to the pickup.

Make the window frame as in Fig. 2D and bolt it to the front panel. If the height of the window in your cab won't permit use of the upper window frame member, let the upper plate act as the top window frame member. Be sure to wrap the edges of the glass with friction tape before installing and use a generous seam of caulking between the glass and the retaining mouldings (Sec. A-A in Fig. 2D). If you prefer, you can hold off on window installations until the whole job is done. This might save some broken glass.



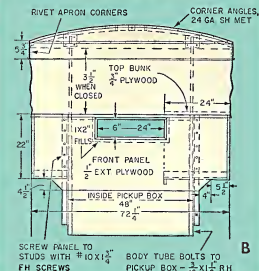
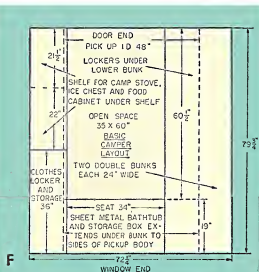
Knockdown table provides indoor eating accommodations on cold or rainy days. Cabinet doors cover storage space under bunks at left side. Padded lid in large storage chest serves as a seat and step-up to upper bunk.

If you plan to cover the truck floor with 1/2-in. plywood, this should be installed now. Since pickup floors vary, you'll have to choose a type of fastener for the job. If the pickup floor has wooden slides, you can use flat head wood screws. Otherwise you'll probably have to bolt it down.

Install the two rear studs in the body sockets and notch the tops of them for the plate as you did the front studs. Notice that both the front and rear plates (Fig. 2E) are notched at each end to half-lap with the side plates. The rear plate is also dadoed to receive the left-hand door jamb. When installing the door jambs, fasten the left hand one with the top screw and bottom lag screw, and the right hand one directly to the stud. If necessary, use a shim between right jamb and stud when fastening them together above the truck box.

Next, install the lower bunk on the left side and the shelf on the right side (Fig. 2). Use temporary cleats to keep these in position while you drill and install the bolts that fasten them to the pickup body. Use ten 3/8 x 2 1/4-in. fh bolts, equally spaced, on each along the centerline of the rolled top edge of the pickup body (Fig. 3C).

At this point you have enough of the parts installed to provide a means of checking following parts for fit. Cut and fit the side plates next. Remember, these are notched at each end to form the half-lap joint with the front and rear plates. Cut corner and side risers to fit. Notch the bottom end of the side risers only to fit over the 1 x 2-in. fills that run along





Galley and clothes locker is on shelf at right side of camper body. Fresh water tank is strapped on right running board (Fig. 14), where it is easily refilled when traveling.

the outside edge of the lower bunk and shelf (Fig. 2). Then install the fills. Attach these to shelf and bunk with glue and nails driven up from the bottom. You can clamp these pieces in place while you nail them. Toe-nail where a fill meets a vertical member. Use glue and #14 x 2 3/4-in. fh screws to secure plates to top ends of risers.

Now you can install the 1/8-in. hardboard side panels. Set them up temporarily by tack-nailing. Then drill and countersink for #4 x 3/4-in. fh screws, locating them 5 in. apart. You can cover the left and right hand side at the rear now or leave it till later. In any event, panels are butted at the corners. The butt is covered with sealer and then a bead of sealer is put down on each flange of the corner covers.

These sheet-metal covers (Fig. 2) can be bent over the edge of a workbench. Be sure, when you take up on the screws that hold them in place, that you have installed enough sealer so excess is squeezed out. The 3/4-in. plywood top bunk merely rests on the framework and is screwed to it and to the stiffener that runs along its inside edge.

Now is a good time to make and install the body braces (Fig. 3D). Hacksaw these to length and bend in a vise. Heating the bend area with a blow torch will make the job easier. Best bet is to cut to length, make bend at one end, check on pick-up body, make second bend, then drill attachment holes. Use the bent-up braces (held in place) as a template to drill holes through pickup body and underside of bottom bunk and shelf.

Roof Assembly. This is a separate assembly that you can fabricate on a bench or floor of the shop. Before you do anything else, be sure to measure and mark down the length and width dimensions of the camper body

MATERIALS LIST—PICKUP CAMPER

No. Req.	Size, Description and Use
3	1/2" x 4' x 8' exterior fir plywood for floor, front panel, bunk, shelf and roof ribs
1	1/2" x 4' x 3' exterior fir plywood for door
1	3/4" x 24" x 8' exterior fir plywood for bunk
3	1/8" x 4' x 8' Masonite tempered hardboard for side panels and roof covers
1	1/8" x 4' x 4' Masonite tempered hardboard for end panels
2	2" x 4" x 8' fir lumber for studs
12	1" x 2" x 12' fir lumber for fills, window frame, stringers, roof splice covers and seal strips
10	2" x 2" x 10' fir lumber for plates, door jamb, risers, sills, stringers, roof ridge and headers
1	1/4" quarter round x 8' long for window
1	5' x 24" double strength glass
4	24 ga. x 1 1/2" x 22" galv. sheet metal for corner covers
36	24 ga. x 1 1/2" x 2 1/2" galv. sheet metal for clips
2	24 ga. x 7" x 75" galv. sheet metal for end aprons
2	24 ga. x 7" x 82" galv. sheet metal for side aprons
2	24 ga. x 1 1/2" x 80" galv. sheet metal for corner angles
4	14 ga. x 4" x 4" galv. sheet metal for bracket back
4	14 ga. x 3" x 8" galv. sheet metal for riser tube bracket
4	14 ga. x 1 1/2" x 5 1/4" galv. sheet metal for tube straps
14	14 ga. x 1 1/2" x 3" galv. sheet metal for lock plate
18	18 ga. x 1 1/2" x 36" galv. sheet metal for door drip cap
1	18 ga. x 3" x 41" galv. sheet metal for doubler
1	1/4" x 3/4" x 10' hot-rolled steel bar for body bracer
4	1" x 4 1/2" thinwall conduit for stationary tubes
4	3/4" x 48" thinwall conduit for riser tubes
1	3/4" x 36" welding rod for retainer pins
1	1" x 41" continuous hinge for door
2 gross	#4 x 3/4" rh screws for attaching sheet metal
2 gross	#4 x 3/4" fh screws for attaching hardboard
36	#10 x 1 3/4" fh screws for bunks and front panel
1	#14 x 2 3/4" fh screws for plates to risers
1	#12 x 2" fh screws for rear plate to left door jamb
1	#14 x 1 1/4" fh screws for bunk and shelf to risers
1/2 lb	3/4" large-head tacks for securing canvas
1 lb	1 1/4" finishing nails for seal strip
40	3/4" x 3/4" fh stove bolts for tube brackets
20	3/4" x 1" fh stove bolts for roof clips
1 gross	3/4" x 1" rh stove bolts for roof clips
14	3/4" x 1 1/4" rh stove bolts for window frame
36	3/4" x 1 1/2" rh stove bolts for window frame and door hinge
8	3/4" x 2 1/2" rh stove bolts for door hinge
2	3/4" x 2 1/4" fh stove bolts for bunk and shelf
2	3/4" x 3 3/4" rh stove bolts for studs to plate
2	3/4" x 5" lag screws for top plates to studs
2	1/4" x 4" lag screws for roof stringers
8	1/4" x 2 1/2" lag screws for floor to door jamb
8	3/4" x 1 1/2" rh stove bolts for body brackets
8	1/4" x 1" fh stove bolts for body brackets to wood
8	1/4" x 2 1/4" machine bolts for studs to pickup
13 ft	3/4" x 1/2" rubber seal strip with adhesive for door, available at auto supply store
4	tubes of Plastical sealer or Red-i-seal, available at auto supply store or house trailer supply house
2	10" x 18" assembled house trailer windows, available from trailer supply house
1	10" x 12" house trailer roof ventilator, available from trailer supply house
1	camper box spreader bar door lock with locking handle and jamb latch, available at trailer supply house

you have just built so you can make the roof assembly to fit your particular job.

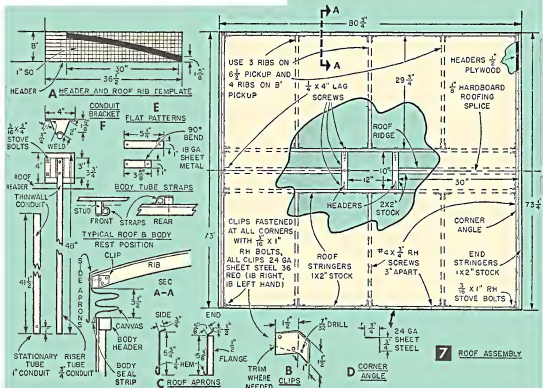
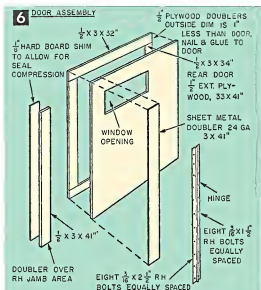
As we've designed it, inside clearance is 72 in. from the floor to the stringers. If you need more, just increase the vertical dimensions of the top headers and side stringers. Of course you will also have to compensate for other parts such as the side and end aprons. The central area of the roof is designed flat which makes the skylight installation a simple matter.

Start by making full-size cardboard templates of the header and roof rib as in Fig. 7A. Use the cardboard templates to draw around when laying out the pieces on 1/2-in. plywood. One way to cut these ribs so all will be alike in shape and size is to nail the stock

x 3/4-in. *fh* screws spaced 3 in. apart, and work from that point toward the outer edges. To bend the hardboard to fit the contour, use a 2 by 4 and clamps across the sheet, clamping it down just ahead of each set of screws. This will produce a well-shaped, tight-fitting

Assemble the ribs to the stringers with clips (Figs. 7 and 11, Sec. A-A). Make the clips as in Fig. 7B and fasten with $\frac{3}{16}$ x 1-in. rh bolts. When installing the ribs, use a straight board placed across the roof ends to assemble the top edges of the ribs flush with each other.

Covering the Top. Set the roof assembly on saw horses or on a flat surface and cut the 1/2-in. hardboard cover slightly oversize. Worry about the skylight cut-out later. Apply sealer on roof ends, outer stringers and ridge. Start fastening along the splice line with #4



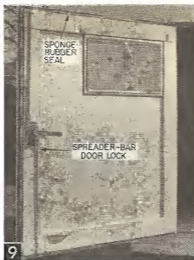
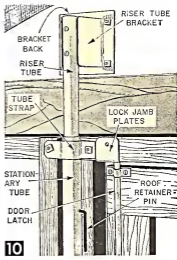


Fig. 8. To raise or lower the roof, car bumper jack with wooden T-crutch extension bolted to it is placed at center of camper floor. Roof is then locked in raised position as in Fig. 11 and car jack removed. Fig. 9. Interior view of door showing purchased house trailer window and door lock. Spreader bars of lock engage holes in jamb plates as in Fig. 11.



Riser tubes fastened to movable roof slide within stationary tubes fastened to lower camper body. Retainer pins inserted through holes in both tubes lock roof in closed position shown.

cover. Make the ventilator cut out with a saber saw or a key hole saw. Coat the splice itself with sealer and then cover with 1 x 1-in. roof splice covers.

Since the roof aprons (Fig. 7C) are difficult to make neatly without a bending brake, try having them made at your local sheet-metal shop. Take the apron length dimensions directly from your assembled roof. Delay installation of the aprons until the roof riser system is in place.

Details of the bracket parts and riser tubes are given in Fig. 7F, and the actual set-up is shown in Fig. 10. First cut the stationary tubes to length. These are not difficult to locate since they abut the body studs; the straps which hold them in place can be shaped on the job. Cut the material as in Fig. 7E, secure one end to the stud (Fig. 10) and then bend the remainder to fit.

Place the riser tubes in the stationary tubes and put the roof in place temporarily. Be sure the roof is accurately positioned and blocked up to be $3\frac{1}{2}$ in. above the body. Remember to allow for the thickness of the upper bunk on that side. Each of the riser tubes should be centered in the stationary tubes. You can do this with small pieces of wood acting as shims. The riser tube bracket parts can be made around a scrap piece of riser tube. The semi-circular seat for the riser tube can be made by slicing a short length of 1-in. tube in half lengthwise, and welding this to bent up sides. Again it might be more convenient to have this part made for you, especially since welding is required.

Clamp the bracket back in position and then place the riser tube bracket in place against the riser tube. Mark the location of the tube seat on the bracket back and have it welded accordingly. Follow this same procedure with each riser tube and bracket assembly. When this is done you can attach riser tubes to brackets and brackets to headers. Then remove the blocks which were holding the roof up.

Lay out $4\frac{3}{4}$ in. from the top of the stationary tube and drill a $\frac{3}{16}$ in. hole through both tube and stud. Do this on all four tubes. Use some scrap lumber to raise and support the roof until inside clearance is 6 ft. (or whatever height you require). Check distance from body top to roof in all four corners. All measurements should be equal. Now, using the holes already drilled in the stationary tube as a guide, drill through again to make the matching hole in the riser tube. These holes are for holding the roof in the raised position with the retainer pins (Fig. 10), which are 8 in. lengths of $\frac{3}{16}$ -in. welding rod bent at a right angle at the center.

Installing the Canvas. Sew the canvas in the form of a large loop and when installing, be very careful to distribute excess evenly around the camper and allow for a vertical looseness of $1\frac{1}{2}$ in. (Fig. 3A and 7, Sec. A-A). This is what we did and after two years of use, the canvas is now just snug and no more. Tack the top of the canvas to the perimeter of the roof. Fasten the bottom of the canvas to the top of the body with the body seal strips as in Sec. A-A, Fig. 7. Tack the canvas

down first, then attach strips with finishing nails. Remember to attach the door drip cap (Fig. 3E) over the door opening, before fastening down the canvas at this point.

Now lower the roof to closed position. Set the aprons in position and check for clearance on all sides. Install the end aprons first. Apply sealer generously under all flanges and bend the ends around the corners so that the side aprons will cover the end aprons. Install the side aprons next. Fasten the corners of the aprons together with aluminum rivets. Next install the corner angles along the ends of the roof (Fig. 7D). This will be easier if you cut a slit at each screw hole to facilitate bending the angle to fit the contour of the roof. Start at the center and work out toward each edge.

Make the Door as in Fig. 6. Be sure to check the size of the door opening on your camper-body so the door will be a good fit. The sheet metal doubler at the hinge is a precaution against bolt pull-out. The hardboard shim under the jamb doubler will force the rubber to seal to half its original thickness and assures a weather-proof closure.

The spreader-bar door lock (Fig. 9) is a standard item sold for camper boxes. But we installed ours vertically instead of horizontally. You may have to resize the bars because of this but that is a simple hacksaw job. When this is fitted, install the lock jamb plates (Fig. 10) so the door will have to be pulled tight to lock. These jamb plates should be mortised into upper plates and floor. When installing door window, apply caulking sealer and fasten to door with screws supplied with trailer window. Install the side panel window and roof ventilator similarly with the exception of reinforcing the $\frac{1}{8}$ -in. hardboard side panel with a $\frac{3}{4}$ x 1 in. window frame on the inside (Fig. 3E).

To raise and lower the roof, use a standard car bumper jack with a T-crutch made from $1\frac{1}{2}$ x $1\frac{1}{2}$ -in. lumber bolted to it as in Fig. 8. It is important when lowering the roof to check and be sure the canvas ring is folded inside the camper body as in Fig. 12.

Knockdown Table and Bathtub. Arrangement of storage cabinets, shelves and table can be varied to suit your individual needs. We equipped ours with a little knockdown table (Fig. 4) so we could eat indoors during rainy weather. A fold-up card table would serve as well.

The large storage box extending across the pickup truck body at the window end of the camper body (Fig. 2F) has a padded cover and is used as a seat. This is the storage box we lined with sheet metal for the bathtub. We fitted the area under the lower bunk with doors of $\frac{1}{2}$ -in. plywood as in Fig. 4 and use the space for storage. You may want to substitute one large lift-off door to cover this area so that long items such as fishing rods or rifles can be stored under the bunks.



Hinged screen is installed over ventilation opening to keep out insects. Dome light is wired to truck storage battery.



When lowering the roof canvas must be folded and tucked inward so it will not become caught and pinched between aprons and sealing strips. Fresh water tank is strapped to running board.

The clothes locker, food cabinet and shelf for the camp stove, located at the right side of the camper (Figs. 2F and 5), are made of $\frac{1}{2}$ -in. plywood joined at the corners with 1 x 2-in. cleats. We mounted the ice box on $\frac{1}{2}$ -in. plywood which is fastened to metal drawer slides of the type used for pull-out phono turntables.

We finished both the interior and exterior with one coat of Firzite followed by one coat of enamel undercoater and one coat of exterior enamel. All galvanized sheet metal was washed with vinegar to etch the surface and given a coat of metal primer before enameling.

● Craft Prints in enlarged size for building car campers are available at \$1.50 each. Order by print number. To avoid possible loss of coin or currency in the mails, we suggest you remit by check or money order. (No C.O.D.'s or stamps.) Now available, our new illustrated catalog of "196 Do It Yourself Plans," 10¢, SCIENCE AND MECHANICS, 450 East Ohio Street, Chicago 11, Illinois. Please allow three to four weeks for delivery.

Bedroom Cooler For \$20



Nine coolant cans will lower the temperature of a small bedroom as much as 10°F. Blower cabinet must fit tightly under the window frame.

For summer sleeping comfort, this ventilating unit cools your bedroom, removes moisture and dust from the air and keeps out insects

By NORBERT PREHLER

WITH cold borrowed from your refrigerator or home freezer, this low-cost unit will cool a small bedroom, office or darkroom as rapidly as a ¼-ton air conditioner.

Cans of Dri-Cube (or an equivalent coolant) store up the cold from your refrigerator, and then serve as baffles around which incoming air is circulated by a blower.

In one test, the nine frozen coolant cans shown in Fig. 1 lowered the temperature of an 8 x 10 x 12-ft. bedroom about 10° F. within 20 minutes, and held this lower temperature for almost two hours. By then, the late evening outdoor air temperature had begun to drop enough so that sleep was undisturbed for the rest of the night.

Saw all cabinet parts from one 4 x 4-ft. piece of ¾-in. smooth plywood (Fig. 3). The 3/16-

in. holes along the bottom rear edge of the cabinet allow water condensing on the cans to drain. Assemble the bottom, back, side and front pieces using glue and small nails. Then waterproof the inside with a good marine varnish or paint. When the paint is dry, line the inside with aluminum foil, fastening it with rubber cement or tape. Fit the foil into the corners tightly so that the bottom of the box is completely protected against moisture, which drains to the rear.

Next install the baffles, which should also be painted and covered with foil. Make the air deflectors by bending light scrap metal around a 3-inch pipe. The cabinet shown in Fig. 1 was intended for either window use or with legs. For window use, cut spacers to make a tight fit, and fasten to the side of the cabinet with cleats and screws.

The blower is a Dayton #2C610, rated at 140 CFM. In free space, this rate of flow will change the air in a 10 x 10 x 8-ft. room every

MATERIALS LIST—ROOM COOLER

No. Req.	Size and Description
1	$\frac{3}{8}$ " x 4 x 4' fir plywood, smooth both sides
1	Dayton 2C610 110 VAC blower or equal.*
9	Wizard Dri-Cube cans, quart size.* Mfr., Boyle-Midway, Inc.
1	DPDT toggle switch
2	box hinges, $1\frac{1}{2}$ " long and $1\frac{3}{8}$ " wide (when open)
1	15 x 24 x $\frac{3}{8}$ " sheet, U-Trim It, Owens Corning Fiberglas.
	Available 89¢, hardware stores.
1	(optional) time switch. See catalog, Lafayette Radio, 165-08 Liberty Ave., Jamaica 33, N. Y.
4	$\frac{1}{4}$ -20 x 1" bolts and nuts with lock washers
1	9-foot appliance cord and plug
Misc.	grille cloth, waterproof paint or varnish, sheet aluminum, screen

* A kit consisting of nine cans and the blower is available from the author, Norbert Prehler, 1625 N. Milwaukee, Chicago 47, Ill., \$17 plus shipping.

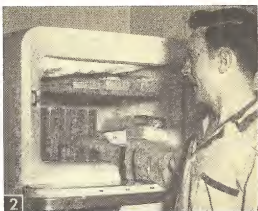
five minutes. But the filter and cabinet will reduce the air flow to less than half of the blower rating, to give you an air change in about 15 minutes. Smaller furnace and ventilating blowers will give you a slower air change.

If blower noise is objectionable (the cabinet acts as a sounding box), mount the blower on grommets, sheet rubber, or felt. Locate the switch on the side and run the wire through the back wall to the motor. As an option, you can add a timing switch (available from electronic supply houses).

One type that sells for less than \$5 will turn the unit off after any preset time up to two hours; another timer would give you 24 hour control, turning the blower on at any desired hour.

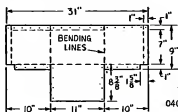
Tack a decorative grille cloth to the back side of the air opening. Cut the air filter (Fig. 3A) from a sheet of U-Trim-It, and make the filter holder by bending scrap window screen material. Use sheet aluminum to make the rain shield, (Fig. 3B), and waterproof the edge where it joins the cabinet.

The sealed coolant cans (available from local hardware dealers or from the author) contain a mixture which, on a weight

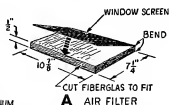


For fastest freezing, allow circulating space between the cans.

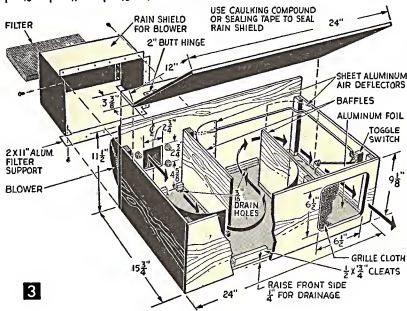
basis, has a cooling effect equal to dry ice. Of course, you could not use dry ice in your room cooler because of the fumes. Using a deep freeze compartment (Fig. 2), the cans will freeze in several hours. At +10°F, in an ordinary refrigerator, the quart can will freeze solid in 8 to 12 hours. But you can use the cans in the room cooler even if they are not frozen solid.



B
RAIN SHIELD
PATTERN
040 SHEET ALUMINUM



A
AIR FILTER

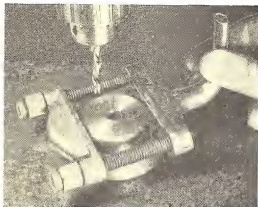


3

SHOP KINKS

Lathe Dog Drill Press Clamp

- A large lathe dog makes a handy clamp for holding round work on the drill press table. If you hold the tail of the dog with your free



hand, you can safely counteract the torque of small drills up to 1/4-in. For larger sizes, use more solid clamping methods.—H. J. GERBER.

Pocket Sheath for Linoleum Knife

- To carry a sharp linoleum knife safely and conveniently, make a sheath from three pieces of thin plywood, or heavy linoleum. Cut out the parts to fit around the knife as shown in the sketch and assemble with brads or glue.—G. E. HENDRICKSON.



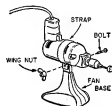
Ceramic Scratch Tool

- A small section of a hacksaw blade inserted into a slot cut in the end of a strip of wood or dowel makes a very useful ceramic tool. A few strokes with this tool quickly prepares the surface of pieces to be joined together. Use fine and coarse-toothed hacksaw blades to make up a variety of scraping and decorating tools.



Adjustable Holder Angles Drill

- A discarded electric fan base makes an adjustable holder for your electric drill that will enable you to work with two hands, with the tool supported at any convenient angle. Make the strap of scrap tin, or sheet metal, and use a bolt and wing nut to fasten it to the base.—J. A. COMSTOCK.

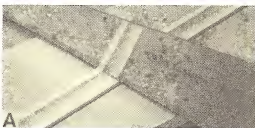


Metal Fluxing Technique

- When soldering metal surfaces (especially aluminum), soldering flux is often needed to retard oxidation of the metal until the solder can be applied. A good way to apply the flux is to "charge" a wad of steel-wool with it and rub the metal surface briskly for several minutes. The rubbing produces a small amount of friction heat which melts the flux and flows it into the many tiny scratches in the metal made by the steel-wool. This fluxing technique roughens the surface and at the same time thoroughly saturates it with flux assuring a very good solder bond.

Reflections Guide 90° Saw Cut

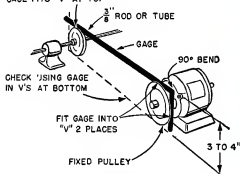
- You can saw a right angle without marking it first with square and pencil, simply by watching the reflection of the edge of the board on the shiny surface of the saw. Move the saw handle (A) until the reflection lines form a straight line (B). The better the light, the better the reflection. A light wipe of oil on the blade helps you to see the reflection and improves the cut too.—N. ENGELS.



Gage Simplifies Pulley Alignment

• With this gage made from a length of $\frac{3}{8}$ -in. tubing or bar stock, you can line up pulleys exactly to obtain perfect operation with minimum belt wear. Make a sharp 90° bend in the metal and cut it long enough to straddle

MOVE PULLEY LATERALLY TILL
GAGE FITS "V" AT TOP



the pulleys on your equipment. To align two pulleys, fit the bent end of the bar into the V at the top and side of one pulley. Then adjust the other pulley until the bar fits into the V on top. To check your alignment of pulleys, and shafts as well, repeat the test from beneath.—W. C. WILHITE.

Removing Outdoor Rust Stains

• To remove rust from a cement patio or stains on siding caused by rusty nails, dissolve 1 part sodium citrate in 6 parts water, add 6 parts glycerine. Mix with powdered whiting to form a heavy paste. Spread a thick coating of the mixture on the stained area and allow to dry. Repeat treatment if necessary. Badly stained areas may require a week or more for complete removal.

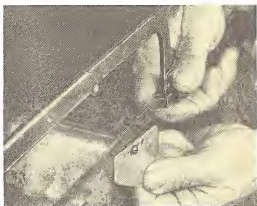
Plastic Rubber Improves Chuck Grip

• If you find that the light knurling on the chuck of your drill makes it hard to get a good grip on large bits, coat the chuck with plastic rubber. The coating dries overnight, and provides a non-slip finger grip.—K. MURRAY.



Holder for Sawing Small Screws

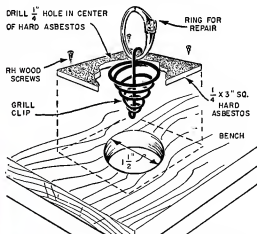
• With this holder, you can cut small screws to length and avoid dropping and losing them on the floor. Cut a tag of thin sheet aluminum, and drill holes to match common



thread sizes. Also drill a $\frac{3}{8}$ -in. hole for hanging on the wall. To use the holder, thread the screw through a matching hole, turn on a nut, and grip the threaded end of the screw in a vise. Hold the tag while sawing. Removing the nut cleans the threads.—E. M. LOVE.

Grill Clip Clamps Small Parts

• This method of clamping rings to the bench while soldering and setting stones was used successfully by a jeweler, but it can be adapted to many other light soldering and assembly jobs. To make this heat-proof holder,



drill a $\frac{1}{4}$ -in. hole in a piece of hard asbestos board. Mount it centered over a $\frac{1}{2}$ -in. hole bored through the bench top. The hook of the radiator clip protruding through the top firmly grips rings, and other small items. Work can be done at any point with both hands free to handle tools.—G. S. WILHITE.

More SHOP KINKS

Scissors Double as Spanner Wrench

- The points of a scissors can double as a spanner wrench for removing retaining rings on a lens, and other light jobs. Secure the scissors legs, spread to the required span, be-



tween two blocks of wood tightly clamped with rubber bands. Allow the points to project just enough to engage the slots in the ring, and grip the wood strips while turning. —K. MURRAY.

Broken Cut-off Wheel Makes Hand Stone

- Glue a broken segment of an abrasive cut-off wheel to a flat block of wood and you'll have a fine oil-stone for sharpening chisels, knives and other sharp tools. You can get abrasive wheels from the scrap department of any machine shop or factory that uses cut-off machines, since the wheels are unsafe to use whenever even minor flaws develop, and are quickly discarded. —W. C. WILHITE.

Hatchet Safety Precaution

- Sometimes the handle of that hatchet so often used around the home can loosen. Unexpectedly it can fly off and cause a serious accident. Check the handle wedge, and for extra insurance drill a hole through the side of the hatchet blade to take a flat headed screw. —C. E. HENDRICKSON.



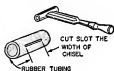
Use Plastic Bag to Grease Bearings

- Packing ball and roller bearings with grease is a slow messy job, and you have to keep dirt and grit out. After cleaning the bearings, put them and the grease into a flexible plastic bag, and you can keep your hands clean and do a better job too. Just knead the grease into the bearings working the outside of the bag with the fingers. —J KRILL.



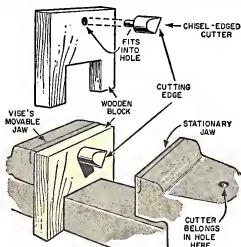
Tubing Guards Chisel Edges

- If chisels are stored loosely in the tool box, or are kept lying on the bench, the edges can become dulled and nicked. Cut slots in short pieces of rubber tubing just long enough to fit tightly over the ends of your chisels. —V. H. LAMOY.



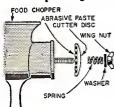
Holder Improves Vise Cut-off

- If your vise has a removable chisel-edged rod cutter that fits the anvil, you can improve it by making this wood holder. Ordinarily, the cutter is used on the anvil to cut small rods and screws by striking with a hammer.



Hit the cutter too hard, and your sharp edge is spoiled. With the block shown in the sketch, you can place the work between the cutter and the stationary jaw, and use the screw to apply a powerful but controlled push to the cutting tool. The material is cut more accurately, and without danger of waste pieces flying through the air. —A. VENA.

Sharpening Food Chopper Cutters

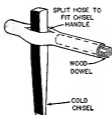


- Sharpen up the blades on your food chopper, and instead of crushed fibrous pieces, you'll have neatly chopped juice-filled particles of vegetable and fruit. And, your chopper will turn with less effort. First,

remove the wing nut and cutting disc. Smear coarse valve grinding compound, or a paste of fine oil and emery powder on the side of the disc that contacts the four-bladed knife. Replace the disc, and slip a short spiral spring (or a thick rubber washer) on the shaft. Partly tighten the wing nut and then turn the chopper handle backwards. Gradually tighten the wingnut to increase pressure on the disc. Add more grinding compound and repeat the procedure until the blades are sharp. Use a strong detergent to remove all traces of oil and abrasive.—W. C. WILHITE.

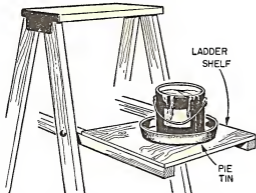
Chisel Holder Protects Hands

- A cold chisel holder made of a length of garden hose will protect your hands from glancing blows. Cut a 2-in. slot near one end of a 15-in. piece of the rubber hose, to fit the chisel handle. Then fit a length of wood dowel into the long end of the hose to serve as a rigid handle.—H. E. MOODY.



Pie Tin Holds Paint Cans

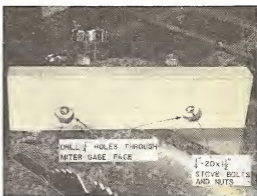
- When a paint can slips off a ladder, it can cause a mess that takes the rest of the day



to clean up. Keep the paint cans securely in place by tacking an old pie tin to the ladder shelf.—V. H. LAMOY.

Slip-proofing a Miter Gage

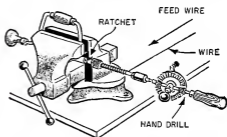
- When a work piece slips on the miter gage of your power saw—so easy at extreme angles—you can waste time and good lumber. Here is a slip-proof attachment that will make your saw safer and easier to use. Drill two 1/4-in. holes in the face of the miter gage.



Make the wooden block with matching countersunk holes to fit the gage. Face the block with medium grit sandpaper. Use rubber cement for bonding the paper, since you have to replace it from time to time.—P. K. SNOOK.

Wind Better Coils with Ratchet

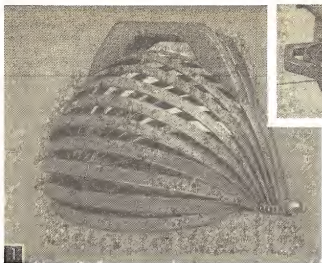
- Ever wind coils or springs with a dowel and hand drill? Then you know it takes steady pressure on the winding knob without letting up for an instant. Here's a better setup. Chuck the opposite end of the dowel



in a ratchet brace mounted in your bench vise. Set the ratchet so it moves only in the direction of winding to prevent backlash. With larger sizes of wire, you'll need a helper to feed the wire.—R. MOORE.

30 Days Only . . .

Beginning with the next issue, your S&M will be on sale for only 30 days. Be sure you buy your copy early at the newsstand—it may be gone if you wait. It will be at your newsstand August 30th—Watch for it.



The basket operates like a fan in reverse; the slats collapse when basket is opened and spread out when basket is closed.

Collapsible Slat Basket

It's ideal for shopping, or carrying knitting, picnic equipment or even a small pet

THIS dome-like basket overcomes the unfriendly habits of many baskets—it folds flat for storage in little space, the contents can't be tipped out when basket is closed, and the handles fold out of the way for easy loading and unloading.

All the slats can be cut from one piece of $\frac{3}{4}$ x 7 x 36-in. clear, grainless pine. A hollow-ground blade can be used for the strip-cutting but you take the chance of burning the blade. A combination blade with set teeth will cut free and clean although it will leave a rough surface on the slats. In either case, make a special insert of Masonite or plywood for your machine, using the regular insert as a template. Cut the slot for the blade by raising the blade through the new insert, thus eliminating the opening around the blade through which the slim slats could be pulled down.

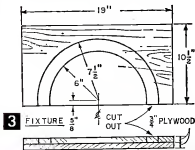
For uniformity in thickness, pass the slats under a drum sander (Fig. 2). This is especially necessary if a blade with set teeth was used to do the initial cutting. Always feed the slats through *against* the direction of rotation of the drum.

Before proceeding further, make the plywood fixture to be used for bending the slats (Fig. 3). Be sure to layout the center point of the arcs $\frac{5}{8}$ in. from the edge.

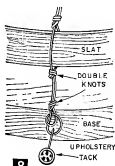
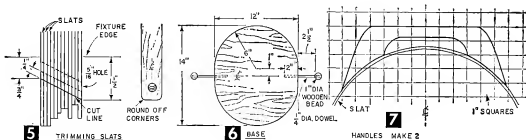
Now thoroughly soak the slats in hot water, and they will bend like ribbons for placing in the fixture (Fig. 4.) When the wood is reasonably dry, trim off the ends of the slats (Fig. 5). Follow the dimensions given carefully, or the basket will not collapse easily.



Sanding the slats. A vertical drill press can be used for this procedure if you make a wooden fence so slats can be passed between it and drum.



Water-soaked slats take the bend easily. Let them stay in the fixture until dry.



Don't drill the hole through the ends until the wood is thoroughly dry, and then do it in stages starting with a $\frac{1}{8}$ in. drill and gradually working up to the full $\frac{3}{16}$ in. Follow this procedure twice to make the slats for each half of the basket.

Next, cut out the base (Fig. 6). Glue the dowels in place, then add the slats, slipping them over the dowels and alternating from side to side. Enlarge the hole already drilled in the bead for stringing to $\frac{1}{4}$ in. to take the dowel, then put some glue on each end of the dowel and press on a wooden bead. Set it with a small brad driven through the bead into the dowel.

Now make the handles (Fig. 7) shaping the ends according to the drawing or from the

MATERIALS LIST—COLLAPSIBLE SLAT BASKET

No. Req.	Size and Description	Use
24 pcs	$\frac{1}{8}$ x $\frac{3}{4}$ x 36" pine	slats
2 pcs	$\frac{3}{4}$ x $10\frac{1}{2}$ x 19" plywood	fixture
1 pc	$\frac{3}{4}$ x 12 x 14" pine	base
2 pcs	$\frac{1}{4}$ dia. x $5\frac{1}{2}$ " dowel	
2	1" dia. wooden bead	
2 pcs	$\frac{3}{4}$ x $4\frac{1}{2}$ x 12" pine	handles
	2 upholstery tacks; 3 yds heavy, waxed twine	

top slats themselves. Sand the handles smooth and cement and brad to the slats.

Finally, double up $1\frac{1}{2}$ yd. of twine and secure it at midpoint of side of base with an upholstery tack (Fig. 8). Space the slats evenly from the base to the top, and then start knotting the twine, making double knots at the top of each slat and at the bottom of the following one. The twine does the job of pulling the slats up when the basket is closed.

Finishing is a matter of preference. Wood can be left natural with a coat of sealer for protection, or it can be stained a light maple and then sealed. If you decide to use stain, do this, as well as the sealing, before assembling the basket.—R. J. DECRISTOFORO.

Inner-Tube Boot Extensions

• Hunters, trappers and other sportsmen who are often obliged to kneel in snow or on damp ground may protect the knees of their trousers by inserting sections of innertubes in the tops of their boots.

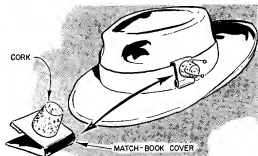


Don't Miss An Issue

The next issue of SCIENCE and MECHANICS will be on the newsstands only 30 days. It goes on sale August 30. Better buy your copy as soon as you see it—the way they've been selling lately, we don't have book copies available, in case you miss one.

Hat-Band Hook Holder

• You need not fumble through your pockets in search of the cork in which you have inserted your extra fishhooks if you glue the

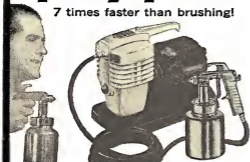


cork onto the back of an empty match-book cover. Simply insert the flap of the book inside the band of your hat to keep the hooks safely and conveniently at hand.—G. E. HENDRICKSON.

pull the trigger...

spray paint

7 times faster than brushing!



Speedy Sprayer ONLY \$32.00
less motor
Prices slightly
higher in the West

Paints anything from a house to a toy. Saves its cost on the first major job! Speedy Sprayer does in minutes what brushing takes hours. Finish is smooth, flawless. Uses any 1/4 h.p. motor with 1/2" shaft. No. 780 Outfit—10 ft. air hose, tire chuck, quart gun, less motor, only \$32.00. Every workshop should have it. At leading stores.

Free! Write for "How To Spray" Booklet and folder.
W. R. BROWN CORPORATION
Specialists in Portable Paint Sprayers for Over 27 Years
2661 N. NORMANDY AVENUE, CHICAGO 35, ILL.

NEW MAGIC RADIO WALKIE TALKIE

YOUR OWN POCKET SIZE RADIO STATION
BROADCASTS TO ANY MOBILE OR CAR RADIO WITHOUT WIRES OR HOOKUPS. We only use 1/2" (5x2x1/4x1/8") built-in telescoping antenna. Powerful Transistor-radio microphone, frequency setter, break-in switch! Ideal for work on well contained facilities. Dynamic electric unit. With the Radio Talkie you CAN TALK TO YOUR FRIENDS NEARBY OR BETWEEN TWO OR MORE CARS! NO BATTERY DISTANCE. INSTANT OPERATIONS! No license or permits needed. Useful and real fun in a million uses! GUARANTEED TO WORK 1 YEAR SERVICE GUARANTEE.



SEND ONLY \$3.00 (cash, cc, and post paid) \$2.00 COD postage and \$2.00 for prompt delivery. COMPLETE! READY TO OPERATE with instructions and hand-drawn maps and books for broadcasts thru any radio you desire. Price may go up soon, as this NEW model Super Powered Radio-Walkie Talkie NOW AVAILABLE ONLY FROM WESTERN RADIO, 811 N. 7th St., NEARBY, NEBR.

KEEP YOUR... on BENJAMIN
Largest Selection in the World
Single Shot & Repeaters
for Every Shooter's Needs! • 25 MODELS
You Can DEPEND ON BENJAMIN... for
Safety—Power—Accuracy—Convenience—Economy

HI-COMP AIR GUNS AND POWERFUL CO2 GUNS
No. 3600 BENJAMIN Super 100 Shot BB Gas Rifle, Non-Toss—Safe—Convenient—Uniform Hi-Velocity Power. →
No. 3620 BENJAMIN Super 45 Shot Cal. 22 Gas Rifle... \$21.95
No. 3100 Super 100 Shot BB Air Rifle, Adj. Shooting Force \$24.95
No. 3120 BENJAMIN Super 85 Shot Cal. 22 Air Rifle... \$26.95
No. 2600 BENJAMIN Super 25-Shot BB Gas Pistol, Safe—No Pumping—Uniform Hi-Power.
No. 2620 BENJAMIN 20-Shot Cal. 22 Gas Pistol, Economical \$20.95
No. 1030 50-Shot BB Air Pistol \$23.50
No. 1320 BENJAMIN 35-Shot Cal. 22 Air Pistol \$25.50

FREE Catalog All Models Benjamin Single Shot & Repeaters—Cal. BB or 177 or 22. Also, Special Hunting & Fishing Knife Offer.
BENJAMIN AIR RIFLE CO., 834 MARION ST., ST. LOUIS 4, MO.



SHOULDER STRAP CLIP



REFER TO
EDITORIAL
WHAT'S
NEW
DEPART-
MENT

KEEP shoulder straps in place with the revolutionary CARRIPIN PIM! Just 1 1/4" long this strap pin clips easily on the shoulder and automatically locks securely in place. Quickly removed in one swift motion and will not twist, rotate, libel for fakes. Transistor Radio. Microphone or any other shoulder strap clipped here. Gains in beautiful chrome or gold finish. Only \$1 postpaid. Send for FREE illustrated catalog listing hundreds of innovative, useful and inexpensive gifts.

CARRIPIN, INC. Box 274-SM, Massapequa, Long Island, N. Y.

Build your own Home



BLOCKMAKER PLANS

Easy to build money saving machine. Self-driven makes 3000 concrete units a day! Brick, flagstone or blockmaker plans. All 3 plans \$3. Money back guar. \$2.00

Ed Loper, Box 76, Dept. SM, Alloway, N. J. EACH

FREE STEEL HUNTING KNIFE



We give you handiest hunting and fishing knife you've ever had! Has 4-INCH LONG highly tempered steel blade—VERY SHARP! Attractive handle. We need knife FREE to acquaint you with our below-wholesale bargains. Please send 25c for handling. NO LIMIT—but send 25c handling for each knife. Order TODAY!
HUNTING KNIFE, Dept. K-561, Box 681, St. Louis, Mo.

APTITUDE TESTING

Learn what you're fitted for BEFORE you start to learn. Building successful careers since 1938. Details FREE
Guidance Associates, 1156 Haypath Road, Plainview, New York



PENNIES
NICKELS
DIMES

COUNTS
STACKS
PACKAGES

ONE PATENTED COINWRAP will count, stack and package rolls of 50c in pennies, \$2.00 in nickels, or \$5.00 in dimes, ten times faster and accurately. Unbreakable, no sagging or adjustments. Used by schools, churches, stores, at home, by all who have the tedious chore of counting and wrapping change. Guaranteed. FREE wrappers and instructions. Postpaid Only \$1.00.

STERLING HOUSE
P. O. Box 626-SM
Dania, Florida

BIG MUSCLES

"THE QUICK WAY," Dr. Young's Scientific Body Building. Revolutionary Discovery. Free information. Send name, address, to: GAUCHO, Box 9309-V, Chicago 90.

EYE GLASSES by MAIL As low as \$1.25

WRITE for FREE CATALOG with 14 LENS SAMPLE CARD



Thousands of Customers for 1939
QUALITY READING — or BIFOCAL GLASSES for FAR and NEAR
Recommended for folks approximately 40 years or older who do not have astigmatism or disease of the eye, and who have difficulty reading or seeing far.

ADVANCE SPECTACLE CO. Inc., Dept. SM8
537 S. Dearborn St., Chicago 5, Ill.

K-144 JAPANESE OPTICAL TELESCOPE

The powerful Japanese Optical Industry has achieved world recognition for its fine cameras and telescopes. Order your K-144 Japanese Optical Telescope at low import price. Comes complete with PRECISION EYEPIECE that adjusts to 2 Miles—3 Miles—5 Mile range. Draw tubes are heavy-duty METAL. Ideal for sporting events, hikes, boat trips, or astronomy. Get accurate closer-up views that you never thought possible! In made in U.S.A. we would have to charge \$9.95 for this telescope. Order your K-144 Japanese Optical Telescope today—send only \$2.50 plus 50c for postage and tax. (33 total) Examine for 10 days... if not delighted return for full refund. Send \$3 cash or check today leave c.o.d. fee.
Quality Optical Imports, Dept. A-1, Box 5095, Miami 1, Fla.

SEE 2-3-5 MILES!

\$2.50



Imagine!

A NEW TYPE SHOE . . . WITH SOLES GUARANTEED FOR A FULL TWO YEARS!

NOTHING LIKE IT EVER BEFORE!

If you're looking For More Money I'll Set You Up
For Life with America's Biggest and Most Sensational
Shoe Line! **SERVE EVERYONE** from BABY to POP and MOM!

Imagine an utterly new material so tough, so durable it is almost impossible to wear it out! It has the highest abrasion (wear) resistance of any substance ever used for soles . . . and Ortho-Vent dares unconditionally guarantee its amazing new Para-Vinyl soles to wear a full TWO YEARS . . . or shoes will be replaced free! This almost incredible "first" is offered in both service shoes and service oxfords—a man's kind of shoe built for a man's kind of work. They'll stand up to anything—grease, chemicals, foot-gripping mud—and despite the fact that they are built for toughest and roughest wear, all of them are lighter, more flexible, **MORE COMFORTABLE** than any work or service shoe you ever heard of before, because they are made with the exclusive "built-in" Spring-Step Cushion Construction. The amazing shoe shown here is one of over 200 styles that make up America's biggest and most fabulous shoe line . . . shoes for men, women, boys, girls, infants and babies . . . shoes for the entire family, for work, for dress, for sports and play. Shoes for YOU to cash in with BIG!



**WATERPROOF
BOOTS, TOO!**

new sole-vulcanizing process is super-strong—no stitches to break, no seams to pop, no way for water to enter ever! They're guaranteed waterproof!



**CUT OUT
COUPON
FOR FREE**

SELLING OUTFIT

If you want lifetime big earnings and top security—a business of your own—fill out the coupon opposite and mail at once. Just drop it in your nearest mail box.

ORTHO-VENT SHOE CO., Inc.

808 Brand Rd., Salem, Va.

In Canada write: Concordia Shoe Co., Dept. SM8

1227 Rue Parc Le Fontaine, Montreal, Quebec

NO SHOE EXPERIENCE— NO INVESTMENT NEEDED

Can you use up to \$32.00 a day—up to \$150.00 a week—up to \$600.00 a month and more? Not a year from now or ten years from now, but starting at once? Then get in on the shoe line that has revolutionized the entire industry—backed by an amazing Selling Plan that includes a Family Discount Plan as well—a combination that is making our salesmen the highest paid men in all the field. See below!

ORTHO-VENT PAYS YOU SIX WAYS—Even if You Sell Only in Spare Time

Not only does Ortho-Vent pay highest commissions, but in addition you get biggest monthly Cash Bonuses, Premium Offers for yourself and your customers. Shoes are given every six months as an extra bonus to producers. O-V's Retirement Income Plan is protection for your future. And Ortho-Vent even protects your business for your widow in the event of death. Only Ortho-Vent offers all this—and more, more, more! Get Details!

ORTHO-VENT SHOE CO., INC.

808 Brand Road, Salem, Virginia

Tell me how I get started in the Shoe Business without any investment and without any previous experience. Also send me your big Selling Outfit FREE.

Name

Address

City..... Zone.... State.....



Although the side cart is not intended for a passenger, S&M editor Bill McHugh couldn't resist giving a local admirer a cautious ride.

By JOE McBRIDE

THIS animated short snorter will barrel you along at 35 mph. When the fun's over, you can tuck it into your car or boat with ease. Lifting it is no problem, as it only weighs 55 pounds.

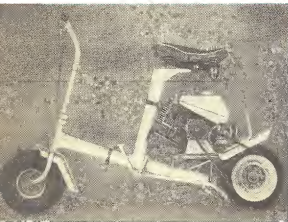
When equipped with the detachable side cart, the scooter becomes a practical package carrier for shopping, special delivery service or tool carrier for farm and field servicemen. With some alteration in size and shape the same method of building and attaching this cart could be applied to adding a side cart to any power scooter.

Although we used a 2-stroke cycle Clinton A400 engine, almost any 2 or 4 stroke cycle engine having a maximum of $2\frac{1}{2}$ hp could be used. The lightweight, vertical cylinder, horizontal shaft, 4 cycle engines, such as the Clinton A2100 or Briggs and Stratton 6B or 6B-5, offer some advantages over the 2 cycles in that they can be throttled down to run smoothly at slow speeds, are easier to start and do not require mixing of oil with the gas. Do not, however, use any of the heavy cast iron engines since their additional weight

located off center on this small powercycle tend to make steering difficult and erratic.

For complete construction details of cycle and side cart, see the bonus blueprint facing this page. If you feel ambitious and care to zip right through the building of one of these powercycles, we are offering a \$25 prize to the first reader who sends us a photo of the cycle he built from these plans in use, together with a letter describing his experience in building and testing it. Postmark on letter enclosing the photo will determine the winner.

Drive mechanism is simplified by using an automatic clutch on engine shaft which engages V-belt to pulley on rear wheel when engine speed is increased.



Combination

Sports and Utility POWERCYCLE

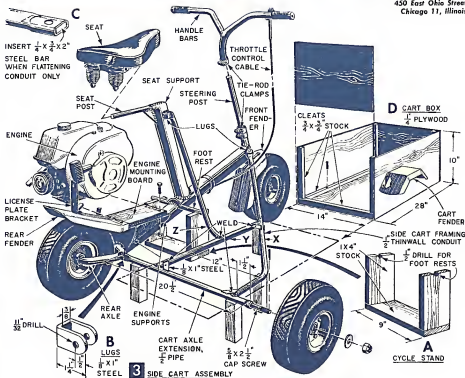
POWERCYCLE

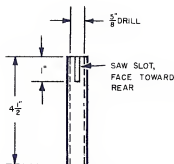
with Detachable Side Cart

CUT ALONG DOTTED LINE

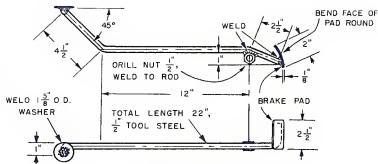


Copyright 1960 by
Science and Mechanics Magazine
450 East Ohio Street
Chicago 11, Illinois

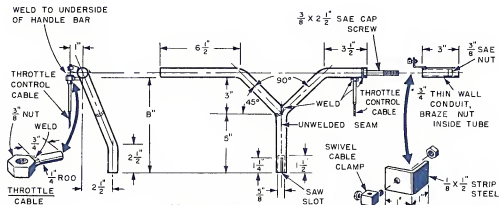




C FORK BUSHING
($\frac{1}{2}$ " PIPE)

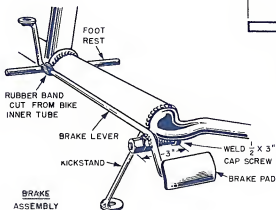


M BRAKE LEVER

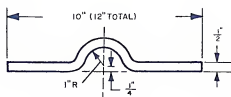


H HANDLE BARS

CONTROL CABLE BRACKET



BRAKE
ASSEMBLY



E FOOT REST
(TOOL STEEL)

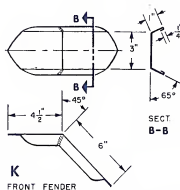
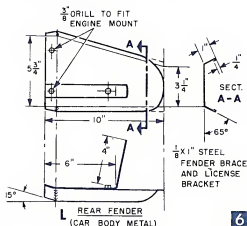
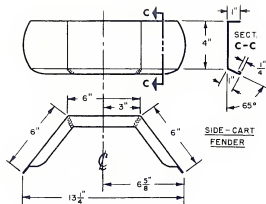


N KICKSTAND

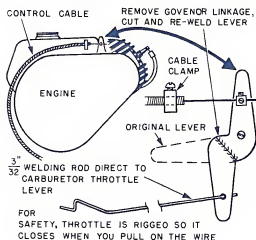
SCIENCE and MECHANICS

Work & Play POWERCYCLE

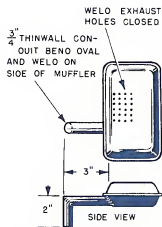
Copyright 1960 by
Science and Mechanics Magazine
450 East Ohio Street
Chicago 11, Illinois



6



J THROTTLE RE-WORK
(CLINTON A-400)



G MUFFLER RE-WORK
(CLINTON A-400-490)

7

You'll have transportation for yourself (Fig. 1) plus load carrying capacity with this little side-cart equipped powercycle. And the cart (Fig. 2) can be detached in the time it takes you to loosen three bolts.

Since the shape and size of the frame members must be determined by the size of other matching parts, have all of the parts given in the Materials List on hand before starting actual construction.

Making the Cycle Frame. Begin by hacksawing the Chevrolet propellor shaft to length as given in Fig. 5A. Chuck, or tack weld a block on the tube end of the shaft for a center, and mount the prop shaft in a metal-turning lathe. The lathe will have to have a 3-ft., between-centers capacity.

If you do not have a lathe to do this work yourself, it will pay you to have the front fork (Fig. 5B) ready for machining too, so that you can have all of the lathe work needed to build this cycle done at one time.

The front fork is made from a Mercury sway bar which is heat-treated spring steel and may be a little too hard for sawing and machining without first annealing. To anneal the bar, heat it to a dull red and allow it to cool slowly. You can do this with an acetylene torch or, better still, if there is an automobile spring shop or heat treating firm in your area, have them heat the entire bar in their furnace.

After machining the front and rear axles, assemble the wheels on them to make certain everything fits well. Then lay out and cut the two bending templates from sheet metal as in Fig. 5. When bending the rear axle and front fork, grip the stock in a vise and use an acetylene torch to heat just those areas of the stock that you are bending. Heat to a bright red and do not hold the torch too long or too close at one spot. If the metal starts to sparkle it indicates it is burning and is too hot. Do not quench with water to cool but allow to cool slowly to room temperature.

An 18-in. length of 1/2-in. black iron pipe with one end drilled out to 5/8-in. so that it can be slipped over the ends turned down for the axles, will protect the machined surfaces and give you the leverage needed for bending. Use the bending templates to check the amount and angle of the bends

occasionally. Final accuracy of bend must be checked by mounting the wheels with tires. Wheel centers must be in line with centerlines of shafts and have clearance for tires. Allow space for installation of fender on front fork. Note that the front fork has a secondary bend, other than those shown on the template, of 2-in. forward for wheel caster effect. The rear axle arm is bent 15° from centerline of tube as in frame assembly drawing Fig. 5.

Cut the fork bushing (Fig. 5C) from 1/2-in. pipe and run a 5/8-in. drill through it to clean up the inside so that the bushing will slide on the turned portion of the front fork.

Then flatten the end of the frame tube (A), and file the top and bottom edges of the tube half round to take the fork bushing at 85° as in the frame assembly drawing Fig. 5. After welding the bushing to the frame, again drill it out because the heat of welding may have distorted it somewhat.

Use the cut off piece of prop shaft tubing for the seat support (Fig. 5D). Grind or file the end of the support to fit tightly against the frame tube. This operation, which is commonly called "fishmouthing" the end of a tube, will make welding a lot easier because you will not have gaps to fill. If you are going to use a Clinton engine as we did, weld the seat support to frame A, locating its center 12-in. from the rear end of the frame tube as in the frame assembly Fig. 5. If you are going to use a Briggs and Stratton aluminum vertical cylinder engine, locate the seat support 10-in. from the rear end of the frame tube. Then heat and bend the foot rest (E in Fig. 5), and weld it to the frame tube right in back of the seat support.

To determine the angle at which the remaining parts are welded to the frame, temporarily assemble the front and rear wheels on their axles. Then slide the ball thrust bearing on the front fork and insert the fork through the fork bushing on the frame. Place one tie-rod clamp at the top of the fork bushing over the saw slot and another clamp above it on front fork shaft (Fig. 4) to keep it from sliding out of the bushing.

To support the cycle and keep it in an upright position while you work on it, make up a wooden stand from scrap 1 x 4-in. stock as in Fig. 3A. Place the

stand under the foot rest, and weld the seat post to the top of the seat support so that it is parallel with the floor. Hacksaw the gusset from a piece of $\frac{1}{8} \times 1$ -in. strip steel and weld it to the corner where the seat post joins the seat support as in the frame assembly Fig. 5. If you are using the vertical cylinder engine with the seat support located closer to the rear, you will not need the gusset and can make the seat post only 5 in. long.

Engine Installation. While you are at the auto wrecking yards have the yard man cut you the two engine supports (Fig. 5F) with an acetylene torch. To save time at the yards, make up paper patterns of the engine supports and have them ready so that you can place them on an old car frame channel and draw around them with chalk. Have the yard man cut off a $2 \times 2\frac{1}{2}$ -in. piece of $\frac{1}{8}$ -in. thick steel for the brake too. Grind the rough cut edges of the engine supports smooth and weld them to the frame as in Figs. 4 and 5F. Reinforce the rear engine support with $\frac{1}{4}$ -in. steel rods welded in place.

The best V-belt pulley to use for the rear wheel is a 7-in. diameter water pump pulley from a Chevy, Olds, or Buick because it has an offset center which provides clearance for the tire. Cut out the center of the pulley and braze it to the rim of the rear wheel at four places as in Fig. 4. Then reassemble the wheel and mount it on the rear axle with slotted nut and cotter pin.

Now, with a V-Plex automatic clutch on the engine drive shaft, place the plywood and engine on the engine supports as in Fig. 4. Line up the V-belt pulley on the engine with the one on the rear wheel and measure the size V-belt needed. After purchasing the belt, place it on the pulleys and mark the location of the engine mounting holes on the engine supports. Drill these holes $\frac{3}{8}$ -in. and bolt the engine in place. To take up belt stretch later, a piece of plywood $\frac{1}{4}$ to $\frac{3}{4}$ -in. thick may be placed under the engine base as in Fig. 4.

The performance of the Clinton A400 engine can be improved by opening up the baffle plates inside the muffler (G in Fig. 7). Weld the exhaust holes closed and for a new exhaust opening, weld a 3-in. length of $\frac{3}{4}$ -in. conduit to the muffler. If you

are going to use the side car on the cycle, weld another 3-in. length of conduit to the exhaust opening as in the side view Fig. 7 to direct the hot gases away from the side of the car.

Handle Bars. Make the handle bars from a '48 Ford tie rod, bending and welding them as in Fig. 5H. Weld a $\frac{3}{8} \times 2\frac{1}{2}$ -in. cap screw to the right hand side of the handle bar for mounting the throttle control handle made from $\frac{3}{4}$ -in. conduit as in Fig. 5H. Weld the throttle-cable support to the underside of the handle bar and slide the cable through it. Thread or spot braze the end of the cable to the supporting $\frac{3}{8}$ -in. nut. The wire inside the control cable is fastened to the swivel clamp bolted to the conduit handle. Run the cable back along the cycle frame and connect it to the carburetor throttle lever. Disconnect and remove the engine governor linkage, and change the lever (J in Fig. 7).

Fenders are required by law in some states for licensed scooters. We made ours from pieces of car body sheet metal which is soft and can be easily cut and bent to the shapes shown in Fig. 6.

Brake. Be sure to use $\frac{1}{2}$ -in. round, water hardening tool steel for the brake lever because ordinary cold-rolled mild steel may bend out of shape and leave you without brakes. Make the brake as detailed in Fig. 5M and mount it on a $\frac{1}{2} \times 3$ -in. cap screw welded to underside of the frame as in brake assembly Fig. 5. Drill the threads out of the $\frac{1}{2}$ -in. hex nut welded to the foot brake so that the nut will slide on the cap screw. Then run a $\frac{1}{2}$ -in. hex nut on the cap screw to retain the brake lever. This same nut is used for the kick stand too. Be sure the nut is on the cap screw before welding the kick stand (Fig. 5N) to it because it would be impossible to install the kick stand otherwise. The nut must also have enough thread drag or friction to hold the kick stand in the up position. If the nut is too loose, collapse it slightly by squeezing in a vise before installing it.

With the exception of lights and a horn, required by some states before you can get a scooter license, your powercycle should be complete and ready for a test run. The horn can be the rubber bulb, beep-beep type available at auto parts and dime stores.

The lights (head light and tail light) can be operated by a #6 dry cell battery or the type used for bicycles.

Side Cart. The best procedure to follow in making and assembling the side cart to the powercycle you have built is to cut and fit the four cart frame pieces (Fig. 3) individually. Start by making the axle extension from a 20½-in. length of ½-in iron pipe. Weld a ⅝ x 2½-in. cap screw on one end, and heat and flatten the other end. Make up three cart attachment lugs as in Fig. 3B and bolt one to the flattened end of the axle extension. Then, with the wheel mounted on the axle extension and the cycle blocked in the upright position on the floor, place the lug end of the axle extension against the rear axle arm of the cycle as in Fig. 3. Cut a couple of 2 x 2-in. blocks for holding the axle extension level with the floor and at right angles to the cycle frame. If you are doing your own welding, tack weld the lug to the rear axle arm of the cycle. Otherwise, clamp or wire the lug to the arm.

Caution: Welding near a gasoline tank can be dangerous business. Be sure to drain gasoline from engine gas tank and carburetor and blow out tank before welding. Or better still, remove the engine from the cycle.

Next, make cart frame part X in Fig. 3. Bend and fit the end that is fastened to the axle extension first. Then bend, cut and flatten the end to be attached to the cycle frame with a lug as in Fig. 3C. Use blocks to hold part X level with the floor and tack weld or temporarily wire the lug to the cycle frame.

Now cut and fit part Y in position, tack welding or taping it with plastic electrician's tape to hold it in place. Follow by fitting part Z in place, fastening the end to the cycle seat support with a lug. Cut the triangular shaped pieces, which reinforce the cart frame and provide mounting-bolt holes for the cart box, and weld them to the frame members. Also complete all the other welding of the lugs and cart frame joints while it is still attached to the cycle to avoid distortion of the parts due to heat of welding.

The cart box is made of ¼-in. exterior plywood reinforced with cleats at all inside corners as detailed in Fig. 3D. Bolt it to the frame with three

¼-in. fh bolts. Make the cart fender (Fig. 6) from sheet metal as you did the cycle fenders, and bolt it to the cart box. Use Shakeproof nuts on the three bolts that fasten the side cart to the cycle so there is no danger of the nuts vibrating loose.

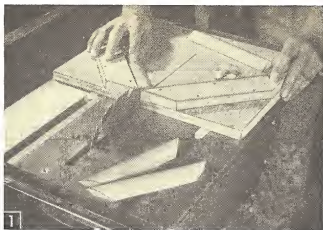
Additional sets of plans available from the designer for \$2 P.P.D. Send check or money order (No C.O.D.'s or stamps) to Joe McBride, 2631 Kensington Way., Stockton 4, California.

MATERIALS LIST — POWERCYCLE

Amt. Req.	Size and Description
1	1952-'54 Chevrolet propeller shaft with 11¼" stem for cycle frame and rear axle
1	1949 Mercury sway bar for front fork and axle (11/16" D.O.)
1	1935-'48 Ford tie rod for handle bars
3	1935-'48 Ford tie rod clamps
1	7" dia., V-belt water pump pulley from late model Chevy, Olds or Buick for rear wheel
1	60" long choke or throttle control cable for engine carburetor control
1	V-Plex clutch with 2" pulley to fit your engine shaft (V-Plex Automatic Clutch Co., Hagerstown, Indiana)
1	½" V-belt. Determine length after installing engine
1	Cinton A400, two-cycle gas engine. Other lightweight four-cycle engines up to 2½ hp may be used also
2	4" cart wheels for 3.50" x 10" General Jumbo Jr., tires and tubes. Wheel hub must have precision ground ball bearings for 35 mph speed. ⅝" bore x 2" long hub length.
1	⅝ x 7" long mild steel round bar
1	½ x 24" round tool steel bar (water hardening type) for engine bracket brace, kick stand and fender brace.
1	½ x 34" round tool steel bar (water hardening type) for brake lever and foot rest.
1	⅝ x 1 x 10" mild steel bar for license bracket
1	3" length of ¾" thinwall conduit for throttle handle
1	⅝ x 2 x 2½" mild steel for brake pad
1	12 x 18" car body sheet metal for fenders
2	engine supports cut from old car frame channel
1	⅝" bore x 1½" O.D. ball thrust bearing (Catalog #605 available from local Boston Gear distributor)
1	1¼" D.D. plain steel washer for kick stand pad
1	1⅝" D.D. plain steel washer for brake lever pad
2	⅝" I.D. plain steel washers for axles
2	⅝" castellated or slotted hex nuts to fit axles
1	¾ x 2½" SAE cap screw and nut for throttle handle
1	½ x 3" SAE cap screw and two nuts for brake and kick stand
4	5/16 x 1¼" SAE cap screws and nuts for engine mounting
2	¾ x 3" bike handle grips
2	½ x 3" bike handle grips for foot rests
1	¾" hex nut for throttle support
1	4½" length of ½" standard black iron pipe for fork bushing

SIDE CART

1	24" length of ½" standard black iron pipe for cart axle extension
1	10" length of ½" thinwall conduit for cart frame
1	⅝ x 1 x 20" mild steel bar for cart frame lugs
3	5/16 x 1" SAE cap screws with Shakeproof nuts
1	wheel and tire of the same type used on powercycle
1	⅝ x 2½" SAE cap screw and slotted nut for cart wheel axle
1	¼ x 36 x 48" exterior fir plywood for cart box
1	¾ x ¾ x 12" lumber for cart box
3	¼ x 1½" fh stove bolts for cart box
1	6 x 18" car body sheet metal for fenders



Simple sliding-platform jig provides perfect miters for frames every time when parts are placed accurately. This one is designed for pieces precut to exact length.

Four Sliding Jigs

Insure Perfect Miters

By R. J. DeCRISTOFORO

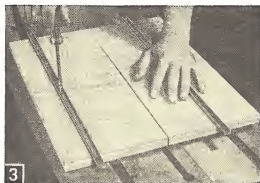
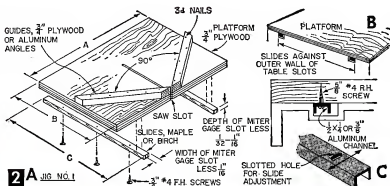
IT'S easy to cut miters on your bench saw, but making them accurate enough for framing joints is another matter.

Your mitering troubles are over, however, if you build one or more of these simple jigs designed to give you a perfect cut every time. Because the jigs move with the work as in Fig. 1, there

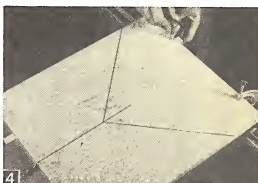
is no saw readjustment for right- and left-hand miters and the problem of "saw blade creep" (tendency to pull the work) is eliminated.

Work carefully in making any of these jigs. Though simply constructed, they must be right in all details. The least little deviation will destroy their effectiveness. Sand each part smooth before assembly.

General Construction. For the platform and most other pieces, $\frac{3}{4}$ -in. fir plywood is adequate, but be sure it is sufficiently dry so that it will not warp. If your saw is very small, substitute $\frac{1}{2}$ -in. plywood. Make width A in Fig. 2A conform to width of your saw table as in Figs. 1 and 9. Depth B in Fig.



Aluminum channel is good ready-made material for platform slides. Hacksaw strips to protrude 1 in. beyond each end of platform and file edges smooth.



It's important to align slides perfectly against outer edges of table slots. Clamp in position to platform, turn work over and fasten securely.



5 Carpenter's square helps maintain exact 90° angle for guides.

2A of jig #1 represents distance from front edge of saw table to front edge of blade when set at 2-in. height. For each of the other jigs described later, this depth B dimension equals the distance from front edge of table to center-line of blade arbor.

For slides, use hardwood to fit miter gage slots of your saw table or, if you want to avoid this job, try ½-in.-wide aluminum channel ¼ to ⅜-in. deep as in Fig. 3. Make slides 2 in. longer than depth of platform (C in Fig. 2A). Be sure to position slides so that outboard sides fit snugly against outboard sides of table slots as in Fig. 2B. There should be a smooth sliding motion without any side play. For adjustment to assure a good fit, slot the attachment holes as in Fig. 2C.

Don't trust a ruler to mark slide position. It's better to set slides in table slots, position platform and clamp slides exactly where they belong as in Fig. 4. Then turn over platform and fasten slides with screws before releasing clamps.

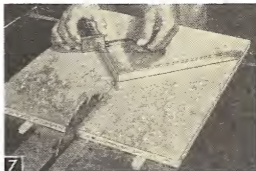
Next, determine position of the guides, which depends on which jig you are working on and cut saw slot, using a blade which will always be available for use with the jig. A hollow-ground combination blade is suggested since it will produce cuts that can be joined without further work.

For guides, use ¾-in. plywood, hardwood or aluminum angle, with length depending on angle desired and distance from saw cut to platform edge. Lay out angle with a protractor, using saw slot as center-line. To assure accuracy, maintain correct angle with a large carpenter's square when securing guides in position with nails or screws, as in Fig. 5.

As soon as finished, protect each jig from accuracy-destroying moisture with a resin



6 Jig simplifies cutting of discs into halves, quarters and —by positioning quarters point first—even eighths.



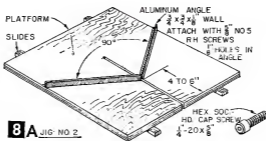
7 Intended for stock of any length, this jig has an adjustable stop block on aluminum angle guide for fast and accurate cutting of many similar pieces.

sealer and two or more coats of shellac.

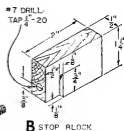
Fixed Miter for Precut Pieces. Jig # 1 (Figs. 1 and 2A), set for a 45° miter, is good for fast work in picture frame production when using pieces precut to exact length. Made correctly, it will give you one or a hundred pieces cut exactly 45°—it can't be otherwise.

You can also utilize this jig to cut discs as in Fig. 6. Merely hold a disc in place on the jig and push the jig, not the work. This will keep work from turning and binding the blade, which would result in a kickback.

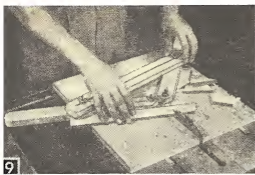
If saw blade projection is set just a fraction above the platform surface, you can cut cross-diagonals on the ends of square or



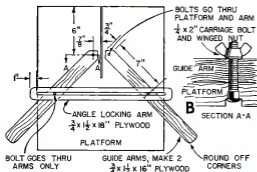
8A JIG NO 2



B STOP BLOCK



Adjustable-guide jig saves time where work frequently requires segment cutting at different angles.



10 A JIG NO. 3

round pieces for mounting on the spur center of a wood lathe.

Miter at Any Point on Stock. Jig #2 (Figs. 7 and 8A) guarantees accuracy of the miter, but leaves exact length of the piece up to the operator. To speed cutting of small frames, you can fit this jig with a stop block as in Fig. 7, made of scrap hardwood or an easily-worked, non-ferrous metal such as aluminum or brass. For aluminum angle guides with $\frac{1}{8}$ -in. wall, shape the block to dimensions given in Fig. 8B.

After cutting one piece to exact length, set stop block to it and you are ready to shape several similar pieces from one length of stock, turning over the stock after each cut so miters will face correctly. If you're working with a shaped molding, attach a stop block to each guide to permit the left- and right-hand cuts.

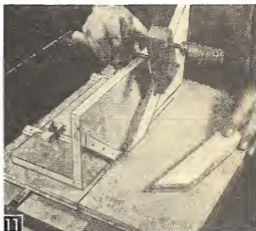
Adjustable Miter for Segment Cutting. Guide angles of the above jigs need not be set at 45°. Merely change the guides to suit if you have a great deal of segment cutting to do at one different angle.

Jig #3 (Figs. 9 and 10A) adjusts to whatever angle you require, two different angles or two similar angles. Using the same type of platform and slides as for Jig #2, cut guide arms and an angle locking arm as in Fig. 10A.

Attach the carriage bolts and winged nuts as in Fig. 10B. After determining exact degree of the miter, lock all four winged nuts to hold jig rigid. If you need a stop, cut the first piece to length and drive a small finishing nail or staple part way into side of the guide arm against edge of the piece.

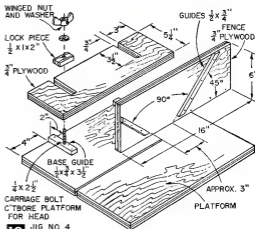
Fence for Miter Grooves. Jig #4 (Figs. 11 and 12) is ideal for forming spline grooves in miter cuts, because it eliminates the danger of tilting and wobbling which could very likely happen when such cuts are made free-hand. The fence is adjustable to handle many stock thicknesses.

Use maple strip for guides and cut other parts out of plywood to dimensions given in Fig. 12. You can add to the utility of this jig by making the guides adjustable or replaceable to change angle of the cut. You can even cut tenons by providing a guide to hold the work perpendicular to the table.



17

Adjustable fence on platform forms spline grooves in miters. To make cut, merely set stock against the guide, clamp in place and move jig past the blade.



12 JIG NO. 4

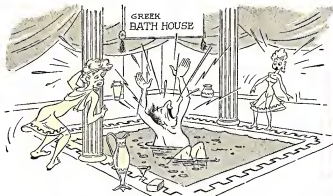
ADJUSTABLE FENCE FOR MITER GROOVES

How to Determine

Specific Gravity

With a scale and weighing stand, you can identify unknown samples of metals, gems, ores and rocks

By HAROLD P. STRAND



"Eureka," shouted Archimedes as he discovered the principle of buoyancy and the answer to the problem of determining whether the king's crown was really pure gold.

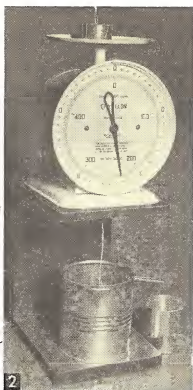
Everyday SCIENCE

Ever since the ancient Greek inventor Archimedes accidentally discovered the principle of specific gravity, the method

has been used to assay metals, identify jewels and to measure the density of materials.

You can prove Archimedes' principle by the experiment shown in Fig. 2. To demonstrate the principle, solder a drain spout to the side of a can. Fill the can with water until it begins to overflow. Now place an empty catch can beneath the spout, and slowly lower in an object. The water which overflows into the catch can will be exactly equal in volume to that of the object. Now weigh the water and the object. Specific gravity = $\frac{\text{weight of object}}{\text{weight of equal volume of water}}$.

An easier way to measure specific gravity is to weigh the object suspended in water (Fig. 3). The model shown is a dietary scale and is sufficiently accurate for specimens weighing a hundred grams or more. If you want to pinpoint the specific gravity of small crystals and gems, you will need to use a

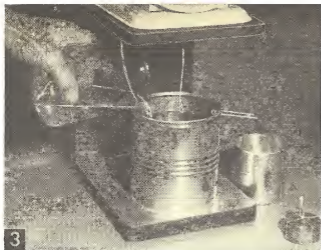


Solder a short length of tubing to a tin can to make an overflow spout. Use fine thread to make the sling which holds the specimen.

finer balance with greater sensitivity. Make the stand (Fig. 4) and fasten a hook to the pivot (Fig. 5) or to the bottom of the pan support on a lab balance. Arrange a fine thread and sling to hold the specimen suspended in the water can.

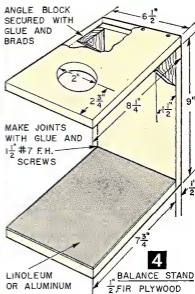
First weigh your specimen in air (Fig. 2). Our sample piece of brass was about $1\frac{1}{2}$ x $\frac{3}{4}$ -in. and weighed 232 grams. Next weigh your catch can; ours was 34 grams. Use another can to mix a few drops of liquid soap with the water. It helps to break up surface tension so the water will not cling to the spout opening. Fill the can until the water just begins to drip down the spout. Wait for the last drops to stop and then place your empty catch can beneath the spout. Now slowly lower your specimen in the water (Fig. 6).

You will be surprised to find that the object weighs less in water. Our specimen now indicated 204 grams or 28 grams less than in air. Now weigh the catch bucket and contents. Ours weighed 61 grams. Deducting the weight of the empty bucket, 34 grams, the net weight of water was 27 grams; this is as close as we can expect to the 28 grams loss



3

Pour water, with a few drops of detergent added, into the overflow can until it starts to run down the spout. Wait until dripping stops before submerging your specimen.



4

in weight because of the accuracy limit of the scale. Thus you have proven Archimedes' principle, that the displaced water is equal in weight to the loss of weight of the object under water.

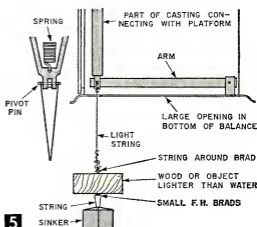
Using this formula:

$$\frac{\text{weight of object in air}}{\text{loss in weight in water}} = \text{specific gravity}$$

$$\frac{283}{28} = 8.28$$

The table (Fig. 8) indicates the specific gravity of brass is 8.4, but since brass is an alloy of copper and zinc, proportions will vary and so will determine the exact specific gravity. Since specific gravity is a ratio or comparison, never use units such as grams or ounces when you write the figure.

Now test various samples. Just weigh them in air, and under water. Be sure that your specimen is hung completely submerged but not touching the bottom of the can. We tried a cast iron ring. It was 317 grams in air, and 272 under water. Apparent loss was 45



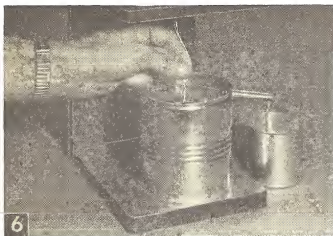
5

grams. 317 divided by 45 = 7.04. The table shows 7.1 as the specific gravity of cast iron. If you are a rock hound, and want to identify gem stones, you will need an accurate balance. Photographers scales available for about \$10.00 are suitable for accurate weighings of small specimens. The book, *Gem Hunters Guide* (\$3.95) published by SCIENCE AND MECHANICS provides a complete listing of specific gravity of gems.

Objects that float are tested according to the same principle but a sinker must be added. We tried a small block of hard pine, (Fig. 7). Use a beaker or glass for the test. First weigh the wood block in air (50 grams). Now attach the sinker, a piece of metal, by means of a short string and a small tack as in Fig. 5. Adjust the scale string so the sinker is under water and the wood block above the water line and weigh (256 grams).

SPECIFIC GRAVITY
(equal to density in grams per cubic centimeter)

Material	Density grams/cu cm	Material	Density grams/cu cm
paraffin	.90	silver	10.50
ice	.92	lead	11.40
water	1.00	platinum	21.45
anthracite coal	1.60	WOODS (air dry)	
magnesium	1.74		
granite	2.60		
glass (crown)	2.60		
marble	2.70	balsa	0.12-0.20
aluminum	2.70	cork	0.20
zinc	7.10	pine, white	0.373
iron (cast)	7.30	spruce, white	0.43
tin	7.80	GEMS	
steel	7.80		
brass	8.50		
nickel	8.80		
copper	8.93		
		emerald	2.6-2.8
		quartz	2.6
		diamond	3.52
		sapphire	3.9-4.1
		zircon (blue, white, golden)	4.69



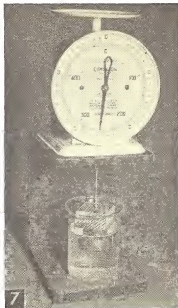
6

Slowly lower the specimen into the overflow can until it is completely covered, but not touching the bottom. The catch can will collect a volume of water equal to that of the specimen.

Objects that float require that you use a sinker for the test. First weigh with the sinker under water, and the specimen suspended above water.

The next part of the test requires that you lengthen the string so both sinker and object are submerged, but with the sinker free of the bottom. The scale read 177 grams, and thus weight loss in water was 79 grams.

Using our formula, Specific gravity = $\frac{50}{79} = .632$



7

The figure for objects lighter than water will always be less than 1. Water weighs 1 gram per cubic centimeter and for practical purposes its density is a constant at ordinary temperatures. *The Handbook of Chemistry and Physics*, found in most libraries, lists the density of thousands of chemicals, elements, minerals, and liquids.

Test Your Science Knowledge

This quiz will test your knowledge of the scientific facts about such things as fish "talk," mosquitoes and the moon

By SHIRLEY MOTTER LINDE



How does a mosquito decide whom to bite?

Biologists at Rutgers University have found that mosquitoes choose their targets on the basis of a person's breath and amount of body warmth. The mosquito has a built-in heat detection system in his front legs that receives heat waves and lets him zero in accurately on his victim.

How cold is the moon at midnight?

It's a cold, cold place up there. By hooking up a pyrometer to a 42-in. telescope, astronomers have found that the moon's temperature at "midnight" is about minus 50°F.

Can your hair really turn white suddenly?

Yes. Medical journals report rapid whitening after acute organic illness, excitement, fright, mental stress or accidents, and in mental patients, paralyzed patients and those with eye ailments. The exact reason is not known. One of the most widely accepted theories is that air bubbles enter the hair and make it appear white through light reflections.

How much salt is in the ocean?

Billions of tons. If all the salt in the oceans could be extracted and spread over the United States, it would make a layer of salt a mile and a half thick.

What's faster than a missile?

The seed of a mistletoe. It explodes from its pod at an initial acceleration of some 5,000 G. In contrast, the

initial acceleration of a typical satellite-launching rocket is from only 5 to 10 G.

What has the largest eyes in the world?

The great blue whale. Its eyeballs are about 5 in. in diameter. The horse has the largest eyes of all the land animals, about half again as large as a human's eyes.

What does fish "talk" sound like?

Some fish sound like the "noisy eating of celery," while a chorus of shrimp sounds like fat frying, according to scientists at the Bermuda Biological Station. The fish-listeners also found that lobsters, like men, develop deeper voices as they mature and that salt water fish talk more than their fresh water cousins.



What's Your Patent Question?

By ALAN MONTAGUE

Patents Editor

SOME of your recent questions have really forced me to blow the cobwebs off my reference files (and to doublecheck a few late developments with some of my patent expert friends in Washington).

It's work, but it's fun, too, so keep those unusual questions coming. Here are some of the latest ones:

Re-Witness Old Disclosure?

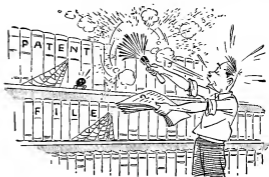
I made the drawing of my invention two years ago, and had it witnessed. Since then I have done nothing about it and have made no changes in it. But now I want to have a search made, and proceed with a patent application if things look favorable. Before having the search made, should I have the drawings witnessed again? (N. B., Michigan)

Having the drawings witnessed again would not affect the situation, one way or another. After you file your patent application, if it runs into interference with another application pending in the Patent Office, you'll have a rough time explaining away the two-year delay. Better file your application as promptly as possible and then pray real hard.

He Needs a Financial Backer

My profession is operating moving picture machines and I have developed a revolutionary new idea in lighting. I have had a patent search made by a registered patent attorney, and he urges me to apply for a patent. But patent application money I just don't have. My hobby is amateur radio and if someone could be located interested enough in my invention to finish paying for the patent, I would turn over all rights and claims in return for a Collins (KW) Kilowatt transmitter and receiver, plus a small percent of royalties. I don't know how to raise money or contact any big shots. What suggestion have you? (J. G., Georgia)

Well, your offer to trade the invention for a radio transmitter is novel, but I doubt that any hams will take you up. My surveys on



this subject of financial backing (I have made three) all show that your best bet is to seek a partner among the local business or professional men. You have played it smart thus far in getting a search made—you have favorable correspondence from your patent attorney, and this is all to the mustard.

Now you should make (or have a local artist or draftsman make) some good, clean, intelligible drawings, and get somebody with a typewriter to prepare a description. Put these into a file folder and carry it around to the local banker, or the secretary of the nearest Chamber of Commerce. One of them can put you in touch with some business or professional men with funds to invest. When you get a backer, have a local lawyer draw up partnership papers. Do not assign a portion of the invention to your backer since an assignment can lead to all kinds of trouble. Go into partnership, instead.

Attorneys and Secrecy

How can I tell what patent attorney will render good service at reasonable cost? Also, are patent attorneys required by law to keep inventions confidential? (G. K., Ohio)

There is no law on the subject, but if an attorney damaged the interest of his clients by being a blabbermouth, he could be disciplined by the Commissioner. In 30 years, I have never heard of any attorney's talking out of turn, so I wouldn't worry about it. As to getting good service at a reasonable price, you will just have to shop around. An application on a simple invention should not cost you much more than about \$300 to \$350. When they start talking about a thousand

READY CUT HOMES

\$2250 AND UP DIRECT FROM MILL

YOU SAVE the items which help make today's building cost expensive: high labor cost, contractor's profit and overhead, insurance, architect's fees. Cut-to-fit eliminates usual lumber and material waste, also costly mistakes. Anyone can assemble. Simple, easy-to-follow plans furnished and each part numbered. Complete with all lumber, roofing, nails, glass, hardware, paint, doors, windows. Freight paid. Low-cost building plans sold separately if desired. 37 Homes and Floor Plans.



**5 EASY PAY PLANS
COLOR CATALOG**

Send 25¢

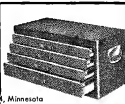
INTERNATIONAL MILL & TIMBER CO.
Dept. 51880 Bay City, Mich.



**Heavy Duty, All Steel
TOOL CHEST
\$28.50**

WHERE ELSE

can you get 4 drawers with built-in locking system, sliding on compound slides—at this price! Baked blue-gray enamel, 26" x 12 1/2" x 12 1/2". Your money back if not satisfied! Write for bulletin, describing all other models.



HUOT MANUFACTURING CO.

508 No. Wheeler Street, St. Paul 4, Minnesota

Constantine's Catalog & Manual for WOODWORKERS

ALL-NEW! 1960 Edition. More than a catalog—a manual, too! 130 pages—complete new text. Since 1812, world's most complete source for rare imported and domestic woods at rock-bottom prices. Inlays, bandings, carvings, hard-to-find hardware, inlaid wood picture kits, new brass hardware, etc. Plus tools, planing projects. Close 25¢ (refunded on 1st order). Get FREE "Chips and Chats" too. Write NOW!

ALBERT CONSTANTINE AND SONS, INC.
2050 Eastchester Rd. Dept. K-7



New York 61, N. Y.



CLOGGED SEWERS? CLEANED INSTANTLY SAVES PLUMBING BILLS —

CHICAGO—July 1st. Just introduced is a Free Booklet on a New Discovery which enables the Home Owner, Janitor, or Factory Maintenance to clean any Clogged Sewer Drain. Yet anyone can operate this new Plumbers' Flushing Gun which releases air pressure on a solid shaft of water cleaning the most stubborn stoppages up to 200 feet. **TOILETS, SINKS, URINALS, BATHTUBS, FLOOR DRAINS, and HOUSE-TO-STREET SEWERS** clogged with Grease, Rags, Sand, Roots, and paper melt away instantly when struck by the Hammer-like blow of this new unit. There is no need to remove wall or pipe, or Grease Trap. A special attachment allows water to flow from the faucet through the Gun while air is released on the pipe. Vents or stacks are no obstacle, as force tends to strike wherever the water lays. But now, what is this Plumbers' Flushing Gun worth in **COSTLY PLUMBING BILLS SAVED?** Test this Ad out—and write your name and address beside it for **FREE BOOKLET.** Obey that urge. No agent will call. A postcard will do (Chicago Phone: Kildare 5-1702) **MILLER SEWER RD. CO., DEPT. SF-8** 4640 N. Central Ave., Chicago 30, Illinois.

**FREE
BOOK**

dollars and up, you'd be wise to shop some more.

Reviving Abandoned Application

I filed a patent application back in 1956 and in 1957 was advised by the Patent Office that one of the claims contained allowable subject matter, but that an amendment would be necessary to bring the case into proper condition to be passed to allowance.

At the time, I was fresh out of money and could not afford to hire an attorney to do this work, so I just dropped the whole business. Now I would like to revive it, but of course my six-month grace period was long ago shot. What do I do? Can I get it reinstated, or could I sell it, as is? (C. B., Washington)

If you had been sick unto death and unable to attend to your business, the Patent Office would probably let you pick up the prosecution where you left it off, but lack of money is no excuse. You will have to start the whole business over anew. Have a search made, to be sure that no recent patents have been issued which would now bar you from getting a grant. If the report is favorable, have an attorney prepare an entirely new application, putting in the amended claim which the Office said was allowable. You ought to get a patent in fairly short order. As to selling the deal the way it is, it's worth a try. Write to manufacturers who might be interested. If you can sell the invention to one of them, his attorney can re-file the application for you.

Responsibility for Bad Search

I have just had a patent application filed, and now, in an old issue of your magazine, I find a picture of the identical invention as patented several years ago. This patent was not cited in the search report made before I filed application, and it looks like I have been gypped. Can my attorney be held for mail fraud, or is it really possible that he didn't know about the existence of this patent? (R. C., Indiana)

You may or may not be right about this; the time to squawk is when and if your claims are rejected on the basis of the claims in the patent to which you refer. It may be that your attorney has strategy all mapped out to get around them. On the other hand, this patent may have been missed entirely in the preliminary search. The particular patents may have been in a group being reclassified, it may have been misfiled or the searcher may have been interrupted . . . many things could have happened to snafu the search. That's why preliminary searches are never guaranteed, and there is no use talking about fraud. You will have to assume that it was an honest mistake. However, if you are finally re-

jected on the basis of this patent which was not cited, and if your attorney is any kind of a Joe, he ought to give you a refund of half your money.

Furniture Invention

Please tell me how to get a new piece of modern furniture on the market. This is something entirely new and original. (J. G., Illinois)

First get a Design Patent. Then, either put the selling end of it into the hands of a broker, or put on your own sales campaign. If you want to handle it yourself, secure a supply of photostats of the official drawings of your patent application, put them into our New Invention for Sale forms (packet of six for a buck), and mail them out to furniture manufacturers. Also, since you are located in Chicago, you could take a day off and go over to the Furniture Mart, making personal calls on the boys.

Wants Selling Information

Please rush me complete details on how I may offer my new Quick Release for sale. (M. R., Georgia)

You don't say what your "Quick Release" is supposed to release, so I can't be very helpful. Anyhow, the thing for you to do is

buy a copy of our book, *How to Find a Buyer for Your Invention*, and bone up on the entire subject. Either that, or put the job in the hands of a patent broker.

Sale of Mexican Patents

I have several ideas I would like to sell. They are patented in Mexico. I believe the usual procedure is to sign a disclosure with witnesses. How safe a protection is this? (B. K., Mexico)

If you expect to have anything to sell in the United States, you must get U. S. patent applications on file before your Mexican patents are one year old, so don't waste valuable time talking about selling procedures. Get on file in Washington at once.

How About National Inventors Council?

Please advise me on a point that has been bothering me. I sent drawings of a device to reduce mortality in commercial aircraft to the National Inventors Council. Did I do wrong? (J. W., Missouri)

Unless the device has some application to military aircraft, the Council might not do anything about it, one way or the other. If the idea is any good, you still ought to get a patent, and sell it through ordinary commercial channels.

SHARPER-CLEARER TV WITH "PLUGTENNA"!



GETS RID OF UNSIGHTLY "RABBIT EARS" & OUTSIDE TV ANTENNAS
 DURESS and better than ALL OTHERS...
 (Text continues with details about the product and its benefits, including a mention of a "Rabbit Ear TV" and a "PLUGTENNA" antenna.)

INVENTIONS WANTED NOW

... for Immediate Promotion! ...

Send for FREE "Protection Form" and Copyrighted Booklet on How To Sell Your Invention, patented or unpatented, for Cash or Royalty.

CASCO, Dept. M, Medical Sciences Building, Washington 5, D. C.

Live Steam Working Models

(Not Toys)

Steam engines, tractors, locomotive, marine, and boilers in miniature. Castings, prints, fittings, hard-to-get supplies or ready-to-run engines and boilers to order.

Send \$1.00 for latest CATALOGUE-MANUAL.

TINY POWER Box 3383, Eugene, Oregon (33 years experience)

TOOLS WHOLESALE

\$100 PUTS YOU IN BUSINESS

Start your own business, sell tools to your friends and neighbors, or buy tools for your own use and SAVE MONEY \$\$\$

A MILLION DOLLAR INVENTORY AT YOUR FINGERTIPS. NO STOCK TO CARRY. ORDER AS YOU NEED IT.

BUY AT WHOLESALE PRICES. Make \$25.00 profit on your assembled purchases. \$1.00 refund on first purchase or refunded if you are not 100% satisfied.

THOUSANDS!! of Nationally Advertised Items of Hand Tools, Power Tools, Foss, Power Motors, Paint Sprayers, Light Fixtures, Appliances, Guns, Gifts, Toys and other items too numerous to mention.

WE SHIP COAST TO COAST Wholesale Discounts up to 50% OFF

SILVO HARDWARE CO. Dept. SM-6 167 Walnut St., Phila. 6, Pa.

INVENTIONS For Sale

Our clients have excellent inventions in many fields to be manufactured and marketed on a cash royalty or license basis. Full description of inventions will be sent to you along with your list of interest. **INVENTORS! WE ALSO WANT INVENTIONS OF EVERY TYPE.** Write for details.

GLOBAL MARKETING SERVICE

2420 77th Ave. Dept. 55 Oakland 5, Calif.

NOW! HOME CRAFTSMEN CAN OWN THIS PROFESSIONAL ARC WELDER

EASY TERMS ONLY \$98.50 F.O.B.

FREE

Now you can own a Trindi full 135 amp Industrial Welder at a price far less than smaller machines. With a Trindi 125A you can weld metals up to 1/2 inch thick. Operates off either 110 or 220 volt line, properly wired. 16 heat stages from 20 to 135 amps. Make and repair anything of metal around the home, garage, farm or shop, like a professional. No previous experience or training needed. Full "do-it-yourself" instructions with each machine. Complete only \$98.50 f.o.b. factory, or write for details. Trindi manufactures a complete line of heavy duty welding machines. Dealer inquiries invited.

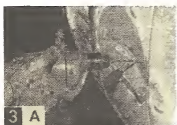
TRINDI PRODUCTS Ltd., Dept. T5-H
 1807 So. Clark St., Chicago 16, Ill.

Guaranteed

12 MONTHS IN CONTINUOUS OPERATION



Left, using suction cup fitting, unique new tool pops out shallow dent where metal is merely sprung, but not creased or bent. Right, typical crease caused by car bumper. Fit piece of sandpaper in flat file and rub it over crease to outline area of dent.



New Ways to Remove Car Dents and Scratches

By P. K. SNOOK

THE local body shop might sock you \$30 to \$35 for a "crease" job and, if you have ever removed a car's inside panel in order to pound out a dent, you would probably agree it's worth it.

Now, thanks to development of a new dent-removing tool, you can do an efficient job yourself (Figs. 1, 2, 3) without disturbing the paneling and for less than half the normal cost. Tool, attachments, flat sandpaper file, fiber glass body filler and hardener make up a kit called the Spaulding Dent Remover, now available for under \$15 in Sears Roebuck, Western Tire Auto Stores and similar outlets.

The Crease or Small Dent commonly caused by bumpers of other cars maneuvering in and out of tight parking areas is often deceptive to the eye so the first step is to define it.

Three steps to dent removal. Top, drilling $\frac{1}{8}$ -in. diameter holes about an inch apart across deepest part of crease. Center, applying gradual pressure with new dent-removing tool to pull out dent with sheet metal screw, a process repeated in each hole. Bottom, after lifting out panel and checking with sandpaper file for low spots, this pattern will appear if panel is properly straightened.



Grind out whole area with disc sander after removing crease. Slightly low spots (white areas in center) will be leveled with fiber glass body filler.

Go over the area with the flat sandpaper file as in Fig. 2 to outline the damaged section. Run your fingers over it to locate the deepest part of the depression, then drill small holes through the metal from one end of the crease to the other as in Fig. 3A. Don't let the thought of actually drilling holes into your car disturb you. They serve a double purpose, allowing you to pull out the dent and giving a firmer hold to the filler as it becomes almost as hard as the body itself. When done, you won't be able to locate the dent or holes.

Chuck a sheet metal screw from the kit in the screw-driver attachment, secure through long end of dent-removing tool and turn screw into an end hole as in Fig. 3B, until it has a firm bite. Apply gradual pressure with the tool until you feel the dent come out in much the same way as you feel a nail give when you pull it out of a board with a hammer. *Don't pry too hard*, or you may ripple the metal. Lift each section a bit at a time, then repeat the process with each succeeding hole until you reach the other side of the dent.

Unless the crease is very severe, one lift on each hole should do the job. If it doesn't, repeat the process until panel regains its original shape. When the dent feels smooth, go over it again with the sandpaper file. If the panel is sufficiently straight to proceed, it will produce a file mark pattern similar to that in Fig. 3C.

After smoothing with a rotary sanding pad on your electric drill, the area should appear like that in Fig. 4. If any low spots are still in evidence, remove with the dent puller. This can usually be done without drilling additional holes.

To fill drill holes and any depressions remaining, scoop out a gob of fiber glass body filler the size of a golf ball onto a polyethylene mixing dish and add a few drops of the

catalyst from the tube of hardener as shown in Fig. 5, following directions carefully. These materials are included in the kit. Mix thoroughly and apply a 1/4-in.-thick layer all over area, with a flexible plastic spreader as in Fig. 6. Use enough pressure to force some filler through the holes, where it will mushroom slightly and, when dry, doubly insure the permanence of the patch.

Once the fiber glass has thoroughly set, sand off the excess, smooth out the whole area with rotary sander (Fig. 7) or sandpaper file and the repaired section is ready to prime and paint. Up to this point, it took us 45 minutes to do the job.

Large, Shallow Dents. Where the metal is sprung rather than creased, as often happens in door panels, use the suction cup attachment with the dent remover. Screw cup to hole in end of the longer arm and fit the pivot pad in slot of the same arm near the bend. Wash the damaged panel with water and moisten the suction cup.

Clamp cup to center of the dent and place pivot pad against panel below. Apply gradual pressure as in Fig. 1 until the dent pops out. To remove suction cup, slide it off panel edge.



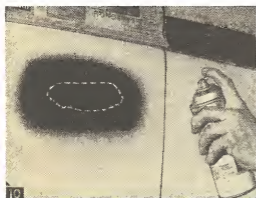
Left, add catalyst to filler in plastic dish and mix well with putty knife. Normal mix will set for sanding in 15 to 20 minutes. Adding more hardener will speed setting, as does warm temperature. Above, use flexible spreader to apply filler, forcing same through holes to anchor it securely. Apply too much rather than too little; it's easier to grind off excess than add another layer.



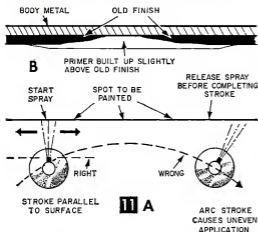
Sanding down hardened filler to original panel shape. Since fiber glass dust is irritating and hard to remove, wear long sleeves; if your skin is sensitive, wear gloves.



Left, this 6-in. scrape is typical of scratches caused by garage doors, bicycle fenders, car doors opened in parking lots which can be repaired easily—if care and patience are your watchwords. Right, sand out scratch to bare metal, also enough of surrounding paint to leave extremely fine feathered edges.



Carefully build up sanded area with primer in series of light coats extending well beyond edge indicated by dotted line. Avoid temptation to rush job with thick applications and let each coat dry thoroughly.



Nicks, Chips and Scratches. The paint on your car is pretty tough stuff to hold up the way it does, considering the beating it takes. Unfortunately, the paint hasn't been made that will deflect flying stones, Junior's bicycle

fenders and other things that cause most of those unsightly little scrapes on your car. If you don't cover them before winter weather sets in, they will be an open invitation to body-rotting rust.

With the recent introduction of touch-up paints and primer in high-pressure Aerosol spray cans, you can make those rough spots in the finish vanish with so little effort

that your biggest problem is to avoid a temptation to rush the job because it seems so easy.

Treatment is generally the same, whether the trouble spots are small scrapes as shown in Fig. 8 or larger exposed areas which started out small and increased as surrounding paint peeled away.

Sand area around the spot with 320 (fine) paper down to the bright, bare metal as in Fig. 9, leaving such a fine feathered edge all around that you can hardly tell where the bare metal ends and the finish begins. Half the success of the job depends on how smoothly you do this step.

You can follow the steps from here on to repaint a dented area repaired as previously described.

After sanding, rub the existing finish around the spot with a cleaning compound until you have a clean area at least 6 inches beyond the part you plan to paint. This is particularly important if your car has a light-colored finish, since any dirt left on the old finish will bleed through new paint and leave a "bull's-eye." Rub out the cleaner, sponge off the residue with clean water and wipe thoroughly dry.

Using primer-surfacer from a push-button pressure-can as in Fig. 10, build up the area with several thin coats, letting each dry before applying the next. Remember to keep the can moving steadily and in a line parallel to the work while spraying as in Fig. 11A, and stop the spray each time before reaching the end of your sweeping motion. Guard against the natural tendency for your hand to arch the stroke or turn the can. Extend the primer beyond the feathered edges and build it up until primer is slightly higher than the existing paint as in Fig. 11B—about .005 in.

When thoroughly dry, sand the built-up primer with 320 paper until smooth and even with the existing paint as in Fig. 12. If you're working on a large flat surface, you'll find it easier to get the necessary smoothness by

12

Smoothing primer surfacer calls for a very light touch to avoid sanding through to the metal or leaving finger ridges.

using a rubber-faced sanding block.

Do the sanding either wet or dry. When through, sponge the entire area again with clean water.

You can buy the push-button spray paint in lacquer or enamel form, and the primer, in auto supply houses and many hardware stores. If your car is a 1956 or later model, you will have no trouble duplicating its original factory color, but some finishes on earlier

FIG. 13—PITFALLS TO AVOID IN SPRAY TOUCH-UP WORK

PROBLEM	CAUSE	REMEDY
Paint runs.	Coats are too heavy	Move can faster.
Paint is ripply.	Can too close; air blast is moving paint.	Hold can farther from work.
Paint is fuzzy; looks like it is full of lint. (Occurs only with lacquer.)	Can is too far from work; paint is partially dry when it hits work surface.	Hold can closer.
Paint peels.	Improper or insufficient sanding; not using primer.	Sand to bare metal and use primer.
Raised area around perimeter of spot painted.	Edge was not properly feathered or primer was not sanded down smoothly.	Finer feather; more complete sanding after priming.



14

Spray finish according to directions on a can and in several coats, each so light that it is hardly visible.

YOU TOO CAN MAKE \$1,000 EVERY MONTH!

How this Coupon led to \$6,345 Business in less than 2 Months

Alfred W. Walter mailed this coupon during the summer of 1959. In less than 2 months, he recorded over 500 dozen units of VX-6, made more money in a month than many men make in a year. Without any knowledge or experience in cars, his FREE palm-sized Electrical Demonstration Unit closed sales in 30 seconds flat.



Alfred W. Walter, Fla.

Proved In His Own Oldsmobile

"I tried VX-6 in my own Oldsmobile. Results were so amazing that I ordered a trial shipment, started selling friends, then found it was as easy to

sell volume users such as farmers, taxis, used car dealers, governments, boat owners, service stations, department stores and industrial users.

65 Million Reasons For Answering This Ad

There are over 67 million cars on the road. Over 2 million already use VX-6, leaving you a fantastic market. One \$2.98 application is all that is needed for the life of the car.

Your story is as simple as that, and these facts are something that can't be resisted by any motorist with a battery in his car and a brain in his head.

FREE! Electronic DEMONSTRATOR

Engineered exclusively by National Dynamics, this mighty midsize salesman makes in the palm of your hand . . . works a small miracle before the prospect's eyes! Put the strength in any glass of water, nothing will happen! Then add VX-6 instantly creating electronic conductivity through the water. THE BULB LIGHTS UP, yet water remains safe enough to drink!



IN JUST 30 SECONDS

you have presented PROOF POSITIVE that VX-6 BATTERIES . . . yet it WILL NOT "HARM" WATER! You get this palm-sized wonder-worker FREE with your first order. When The Bulb Lights, The Sale Is Made!

NASCAR Champion LEE PETTY

Lee Petty, 1959 racing champion and winner of Daytona "500 Mile" uses VX-6 in his racing car, personal car and even in his farm equipment. "I wouldn't drive without VX-6, and I'm glad to testify to this fact to the motorists of America."

LABORATORY TESTED



More Than 2,000,000 Already Sold to various departments and divisions of U.S. Government and The Armed Forces

- A & P, Canada Dry, Chrysler Corp., Coca Cola, General Electric, General Mills, General Motors, National Dairy, Pan-American Airways and thousands of other business firms.
- AND OVER 2 MILLION PRIVATE DRIVERS!

THEY DO IT EVERY DAY

Carl Roberts California . . . \$305 Every Month Part Time
John Burt Idaho . . . \$1,554.00 In Only One week
Vernon Culver Texas . . . \$7,079.00 6 Months
S. Lester Mass. . . . \$53,139.28 In 1957, 1958, 1959, 1960
B. Ray Virginia . . . \$23,894.55 In 1958, 1959
S. J. Lane New York . . . \$15,890.30 In One Year Only

NATIONAL DYNAMICS Dept. DN-5

220 East 23rd St., New York 10, N.Y.
IN CAN.: 539 King St., W., Toronto

NO EXPERIENCE NEEDED

Every car of any kind, any year, model or condition needs VX-6 protection. One application is all that is needed for the life of the car, and immediately old batteries spring back to life.

FREE SALES KIT



Sales Guaranteed or Money Refunded

Yes, this is the offer that National Dynamics makes you! Send coupon below for the free, complete VX-6 Sales Kit, big earnings plan, illustrated literature—everything you need to get started at once making good money in your area PLUS INFORMATION ON HOW TO GET YOUR FREE ELECTRONIC DEMONSTRATOR.

NATIONAL DYNAMICS, Dept. DN-5

220 East 23rd St., New York 10, N.Y.

Send me free information on how to get started making big money with VX-6 right away, plus the NEW 1960 National Dynamics Sales Kit.

NAME

ADDRESS

CITYZONE.....STATE

NEW BELSAW MULTI-DUTY POWER TOOL SAWS-PLANES-MOLDS



Now you can use this ONE power-feed shop to turn rough lumber into moldings, trim, flooring, furniture... ALL popular patterns. RIP... PLANE... MOLD... separately or all at once with a one HP motor. Use 3 to 5 HP for high speed output. Low Cost... You can own this power tool for only \$30.00 down payment.

Send postcard today for complete facts.

BELSAW POWER TOOLS, 951 Field Bldg., Kansas City 11, Missouri

2 WAY RADIO FOR YOUR CAR!



Mounts under dash in any (12 volt) car or truck equipped with ordinary radio. Install it yourself in a few minutes—full, easy instructions NO PERMIT OR LICENSE NEEDED—Meets all Gov't regulations. Talks between cars 1/2 to 5 miles or more, depending on local conditions. Recharge all Citizens band electric. Small, neat 2 1/2" x 3 1/2" size. Complete—nothing else to buy! Uses standard car aerial—Does not interfere with regular radio. Can be adapted for office or home use. Guaranteed performance.

SEND ONLY \$5.00 and pay postman \$4.95 plus COD postage on arrival or send \$10.00 for postpaid delivery. AMAZING VALUE FOR LIMITED TIME ONLY. Order now for early delivery. AVAILABLE ONLY FROM:

WESTERN RADIO

Dept. KSM-8

KEARNEY, NEBR.

FREE THE HISTORY OF THE COMPASS SEND FOR YOUR COPY

NEAR DINSMORE Celebrity COMPASSES

in Beautiful GOLD or SILVER

A jeweled, precision instrument—designed for modern cars. Full, indirect illumination. Sharp, clear letters. Silver or gold Celebrity models \$7.45, standard models \$5.95, illuminated \$6.95 APPROVED BY AUTO MAKERS Fine Quality Composites for over 31 Years

DINSMORE INSTRUMENT CO.
1809 Kelso St., Flint 3, Mich.



Write for Folder

Works in seconds!

Loosens Rusted Bolts nuts, screws, "frozen" parts!

LIQUID WRENCH
SUPER-PENETRANT

The super-penetrating rust solvent that quickly loosens rust and corrosion.

AT ALL HARDWARE AND AUTO STORES

RADIATOR SPECIALTY COMPANY
CHARLETT, N. C.

ELECTRIC WELD - BRAZE & CUT

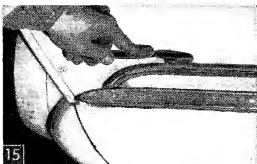
REPAIR MOST EVERYTHING MADE OF METAL

Home Appliances, Auto parts, Farm-garden equipment, toys. Make and repair power-ground equipment, lawnmowers, lawns, ornamental iron work, gates, wagons, etc. Solder, heat, bend, and straighten with terrific heat from argon torch. Cut and weld up to 1/2" steel plate. A million uses for home, auto, farm, inventory, specialties, etc. Works from any home 110 volt plug-in. Complete 110 volt plug-in, Complete 110 volt plug-in, Complete 110 volt plug-in.

plete with all the welders make, are torch, supply of carbon welding and brazing rods. Solder, flux and complete Welding Instruction Book. Attractive—portable—durable—durable 1 year guarantee. We, only 4 for

SEND ONLY \$3.00 (cash, cc, mo) and pay postman \$9.95 plus COD postage on arrival or send \$12.00 and we will send postpaid. Ideal gift for mechanically minded home owners, relatives, friends. Order now for early delivery. Available only from:

MIDWAY WELDER Dept. DSW-8 Kearney, Nebraska



Old toothbrush and rubbing compound will make short work of stains along edges of chrome trim.

models may be difficult to match. To be sure, test it first with a little spot under the hood or some other obscure part of the body. Then study the chart in Fig. 13 to check on causes of paint failure and how to avoid them.

Apply the finish in the same way as the primer with several light coats as in Fig. 14 but extend the coats slightly beyond the primer edge. If the area is large, a light mist sprayed just after the finish from a can of leveler (thinner) will help smooth out any lumps. After the leveler has dried, give the spot a very light finish coat.

If you are using enamel, keep the car indoors at least overnight and wait at least two weeks before applying some rubbing compound and rubbing out the new paint. You can speed up the drying period with an infrared lamp or even a large incandescent bulb in a heat-concentrating reflector.

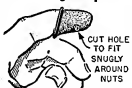
If your finish is lacquer, it will dry almost instantly and you can then apply the rubbing-out process. When finished, you shouldn't be able to point out the spot to anyone else.

Chrome Trim Stains. While you have the rubbing compound out, take advantage of the opportunity to rid your car of blemishes that frequently appear along edges of the chrome trim. Usually they are stains from rust on clips that hold the trim in place and do not mean that actual rusting has started below the paint along the trim strip.

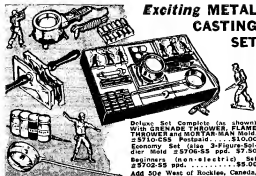
Substitute an old toothbrush for your rubbing rags to get well down into cracks between car body and trim as shown in Fig. 15 and remove all traces of stain.

Finger Wrench Reaches Tight Spots

• Cut a hexagonal hole in a rubber finger tip and you have a wrench that's fine for starting nuts in close spots on electronic chassis, in clocks, appliances, and instruments. The rubber finger tips are ordinarily used for handling paper.



Exciting METAL CASTING SET



Deluxe Set Complete (as shown) with GRENADE THROWER, FLAME THROWER and MORTAR-B&N Mold #5710-CSS Postpaid... \$10.00
 Economy Set (also 3-Flame-Solider Model #5706-SS ppd. \$7.50
 Beginners (non-electric) Set #5702-SS ppd. \$5.00
 Add 50c West of Rockies, Canada, and Mexico

Home Foundry Mfg., 1826 S. Washenaw Ave., Chicago 6, Ill.

1 METAL Pocket Rubber Stamps



Regular Indestructible. Custom Made. Inked and ready for instant use. Any 3-line text, 3/4" x 2" area. Deluxe Model has "Finger-Tip" Control, self-looking case.

2

SAMUEL H. MOSS, INC. Send Check or M.O. Mailed POSTPAID 34 E. 23rd St., N. Y. C. 10 Dept. SM-B

Heavy Duty Type ALLEN PUNCH PRESSES



Model BT-5 5 ton \$199.50
 for less motor

Hundreds of Different Model combinations 1 to 25 ton capacities Moderate in price Fully guaranteed

See your supply dealer or write for Free catalog giving complete information and prices on our Heavy Duty Punch Presses.

ALVA ALLEN INDUSTRIES, Dept. SM, Clinton, Mo.

BUILD YOUR OWN AIR CONDITIONERS

From Junked Refrigerators for a Few Dollars INSTRUCTION BOOKS SHOW YOU HOW... 75c EACH

"HOW TO BUILD a Low Cost Air Conditioner"
 "HOW TO BUILD an Automobile Air Conditioner"
 "HOW TO BUILD a Low Cost Home Freezer"
 "HOW TO BUILD an Electric Air Conditioner"
 "HOW TO BUILD a Low Cost Dehumidifier"

Complete "Install-It-Yourself" Air Conditioner kits for home and automobile, 2 ton capacity. Brand New Parts—\$92.00 and up.

KOOL ENGINEERING CO., Dept. B-8, 1331 N. Larrabee, Chgo. 10, Ill.

Special Offer 2 Books—\$1.00 3 Books—\$1.50 or all 5 for \$2.00

FREE! Instructions and Literature on kits.

\$3.25 OR 2 FOR \$6.00!

With 40 ft. of wire. Additional wire 3c ft.

TESTED AND GUARANTEED. Write for free list of all types and telephones. Shipments F.O.B. Simpson, Pa.

TELEPHONE ENGINEERING CO., Dept. SM80, Simpson Pa.

30 DAYS ONLY Beginning with the next issue, your S&M will be on sale for only 30 days. Be sure you buy your copy early at the newsstand—it may be gone if you wait. It will be at your newsstand August 30th—Watch for it.

RUPTURED

BE FREE FROM TRUSS SLAVERY

Surely you want to THROW AWAY TRUSSES FOREVER, be rid of Rupture Worries. Then Why Do you put up with wearing a gripping, chafing and unsanitary truss the balance of your life? If you do, it will NOT be through necessity but through choice on your part. Now there is a new modern Non-Surgical treatment that is designed to permanently correct rupture. These Non-Surgical treatments are so certain, that a Lifetime Certificate of Assurance is given. Write today for our New FREE Book that gives facts that may save you painful, expensive surgery. Tells how non-surgically you may again work, live, play, love and enjoy life in the manner you desire. There is no obligation.

Excelsior Medical Clinic, Dept. H6824, Excelsior Springs, Mo.

Superior's New Model 70 UTILITY TESTERSM FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS • AUTOMOBILES • TV TUBES

As an electrical trouble shooter the Model 70:



- Will test Testers, Irons, Solder, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lamps, Fluorescents, Switches, Thermostats, etc.
- Will test all TV tubes for open elements, inter-element shorts, burned out tubes, etc.
- Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistances, Leakage, etc.
- Will measure current consumption while the appliance under test is in operation.
- Incorporates a sensitive direct-reading resistance range which will measure all resistances commonly used in electrical applications, meters, etc.
- Leakage detecting circuit will indicate sensitivity from zero ohms to 5 megohms (5,000,000 ohms).

As an Automotive Tester the Model 70 will test:

- Both 6 Volt and 12 Volt Storage Batteries • Generators • Starters • Distributors • Ignition Coils • Regulators • Relays • Circuit Breakers • Cigarette Lighters • Stop Lights • Condensers • Directional Signal Systems • All Lamps and Bulbs • Fuses • Heating Systems • Hertz • Also will locate poor grounds, breaks in wiring, poor connections, etc.

Model 70 comes complete including 40 page book, only... \$15.85

SHIPPED ON APPROVAL NO MONEY WITH ORDER—NO C.O.D.

Try it ten to 15 days before you buy. If completely satisfied then send \$5.00 and our balance at rate of \$4.00 per month for 6 months — No Interest or Finance Charges. Model 70 not completely satisfied, return to us, no explanation necessary.

MOSS ELECTRONIC, INC.
 Dept. D-773, 2849 Tenth Ave., New York 34, N. Y.
 Please read Model 70. If satisfactory, I will pay on terms specified. Otherwise I will return tester.

Name _____
 Address _____
 City _____ State _____
 All prices ext. F.O.B. N. Y. C.



Olson

* FREE

Fill in coupon for a FREE One Year Subscription to OLSON RADIO'S Fantastic Bargain Packed Catalog — Unheard of LOW, WHOLESALER PRICES on Brand Name Speakers, Changers, Tubes, Tools, Hi-Fi's, Stereo Amps, Tuners and other Bargains.

NAME _____
 ADDRESS _____
 CITY _____ ZONE _____ STATE _____

If you have a friend interested in electronics send his name and address for a FREE subscription also.

OLSON RADIO CORPORATION

204 S. Forge St., Akron 8, Ohio

BOATS

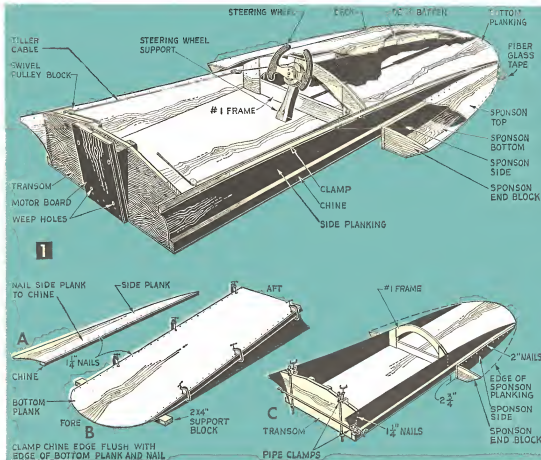
Simplest 3-Pointer Hasty Hydro

For a week's spare time and \$20, this
speedy water sprinter can be yours

By **WILLIAM D. JACKSON**

Naval Architect

Craft Print Project No. 308





The high speed of a 3-point hydro is possible because only a small portion of the aft end of the sponsons and extreme aft end of the hull at the transom touch the water.

WITH under-hull lines similar to those on the 150 mph world speed record breaking boats, this little craft will give you the most in speed and fun from your outboard motor.

Any outboard from 5 to 15 hp can be used and, although extremely fast (25 mph with 5 hp, 35-40 mph with 15 hp), it is not intended for rugged competitive racing in sanctioned N.O.A. or A.P.B.A. races. But, for the sheer fun of running circles around so called "speed boats" on your local small lake, it can't be beat.

Construction. To make certain you can cut all of the $\frac{1}{4}$ and $\frac{3}{8}$ -in. plywood pieces from two 4 by 8 ft. sheets, carefully lay out the outlines of all the pieces nesting them together as in Figs. 3 and 4. Layout dimensions for the transom are shown in Fig. 2. For a pencil guide when drawing the curved lines, use a $\frac{1}{4}$ x $\frac{3}{4}$ -in. strip of wood bent against small nails partially driven into the plywood. A portable electric jig saw will make short work of cutting all the plywood parts to shape. If you do not have such a saw, use a crosscut hand saw for the straight cuts and a key hole saw for the curved cuts. Be sure to cut the slits in the fore end of the decking and aft end of the sponson bottom pieces.

Now, using the $\frac{1}{4}$ -in. plywood transom piece as a pattern, mark and cut the transom frame pieces as in Fig. 2. Fasten them to the plywood transom with waterproof glue and 1-in. nails spaced about 3 in. apart and staggered.

Next, make the #1 frame from $\frac{3}{4}$ -in. lumber as in Fig. 2 and assemble with $\frac{1}{4}$ -in. plywood gussets glued and nailed to both sides of the frame. For chines and clamps (Fig. 1) rip a stock size 2 by 4 as in Fig. 5C. A combination circular saw blade should be used since a rip saw blade will cut too wide a kerf and reduce the size of the pieces. Lay out curved tapering fore ends on the chines and saw to shape with a bandsaw. Set the clamps aside for the time being, and assemble the chines to the lower outside faces of the side planks (Fig. 1A). Use glue and $1\frac{1}{4}$ -in. nails, and be sure to place the chines on opposite faces so that you have one right and one left hand side plank.

Hull Assembly. No building frame is required to assemble this 3-pointer. Begin by assembling the two side planks to the $\frac{3}{8}$ -in. plywood bottom plank in the upside down po-

STATEMENT OF USES

USES: Inexpensive easy to build 3-point hydro for noncompetitive racing and water sport use.

POWER: 5 to 15 hp outboard.

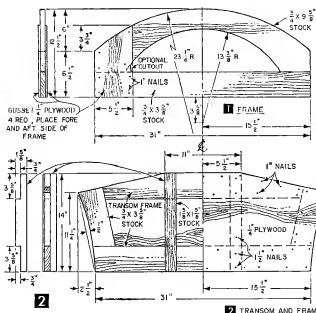
SPEED: 25 with 5 hp—35-40 with 15 hp.

LENGTH: 8'5".

BEAM: 54" at sponson, 34" aft of sponsons.

WEIGHT: 75 lbs. with steering gear.

CONSTRUCTION: Plywood over wooden frame.



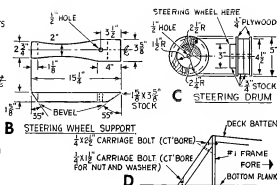
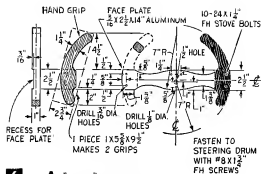
sition as in Fig. 1B. Use glue and C-clamps, and position the aft edges of side and bottom planks flush. Be sure chines are on the outside and flush with long edges of the bottom plank. Then fasten with 1¼-in. nails spaced 3 in. apart and staggered slightly to avoid splitting the chine. Remove the clamps and turn the assembly right side up.

Next, position the #1 frame between the side planks so that the aft side of the frame is 48 in. from the lower aft end of the side planks (see A-A Fig. 5). Mark side and bottom planks along both sides of #1 frame with a pencil line and remove the frame. Apply glue within pencil marked areas and an edge of #1 frame and reassemble it between the side planks. Use 1¼-in. nails spaced 3 in. apart to fasten side and bottom planks to frame.

Fit and position the transom between the side planks so that the plywood of the transom is flush with the aft edge of the bottom planking. Draw pencil lines for applying glue as you did when installing the #1 frame. The shape of the transom ends will force the side planks outward at the top, giving a flared fin-like appearance at the aft end of the boat.

After coating contacting surfaces of transom and sides with glue, reinstall the transom and clamp it to the bottom planking with two short bar clamps. Then draw in the side planks with a 36-in. long bar clamp (Fig. 1C) until the sides conform to the curvature of the transom ends. Fasten with 1¼-in. nails spaced 3 in. apart and staggered slightly.

The sponsons are



6 A "DRAG" STEERING WHEEL

the next items of assembly. First lay out and cut two sponson sides and two sponson end blocks from $\frac{3}{4}$ -in. stock as in Fig. 5D and E. Fasten the end blocks to the side pieces with glue and $1\frac{1}{2}$ -in. nails and then fasten the side pieces to the chines with glue and 2-in. nails as in Fig. 1C. Position the top edges of the sponson side pieces flush with the top edges of the chines and the aft end of the sponson sides $2\frac{1}{2}$ in. forward of the #1 frame location (see A-A Fig. 5). The bottom aft edge of the sponson sides should project $2\frac{3}{4}$ in. below the bottom planking (Fig. 1C).

With the hull thus far assembled, temporarily place the $\frac{1}{4}$ -in. plywood sponson top pieces in position to see that they fit tightly against the side planks and make good gluing contact with the top edges of sponson sides and end blocks. You may have to fair the top edges of the sides, end blocks and chines with a block plane so that the sponson tops fit tightly. The outer edges of these top pieces should project about $\frac{3}{8}$ in. beyond the pointed end of the end blocks to join with the bottom pieces. Mix a small amount of sawdust with the glue to fill any voids when permanently installing the sponson tops. Fasten with $1\frac{1}{4}$ -in. nails.

Now, turn the hull over and fit and fair the bottom edges of the sponson sides and end blocks so that the sponson bottom pieces fit snugly. File or plane a bevel on the outer edges of the bottom pieces where they join the top pieces as in Fig. 5A. Before fastening the bottom piece in place, give the entire inside of the sponsons including the bottom a coat of Penta wood preservative, and allow it to dry thoroughly.

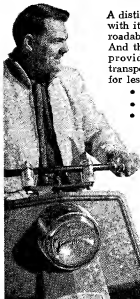
Fasten the bottom sponsons with the glue and sawdust mixture and $1\frac{1}{4}$ -in. nails. Make up a thick mixture of glue and sawdust for use along the seam where the outer edges of top and bottom planking join, applying this with a putty knife so a fillet of the glue mixture will be formed on the inside of the joint as in Fig. 5A. Fasten with 1-in. nails driven through both top and bottom pieces of plywood and clinch nail over on under side. When nailing, back up the bottom plywood

MATERIALS LIST—3-POINT HYDRO			
Amt. Req.	Size and Description	Use	
1	$\frac{1}{4}$ " x 4 x 8' A-A exterior fir plywood	sponson and deck planking	
1	$\frac{3}{8}$ " x 4 x 8' A-A exterior fir plywood	bottom and side planking	
1	2 x 4" x 12' fir	chines, clamps, steering post and transom	
1	1 x 4" x 10' fir	transom frame #1 bottom frame	
1	1 x 4" x 5' fir	deck batten	
1	1 x 6" x 8' fir	sponson sides and motor board	
1	1 x 10 x 36' fir	deck beam #1 frame and sponson end blocks	
1 lb	Weldwood glue		
$\frac{1}{8}$ lbs	1" nails Stronghold or #S211A Maze nails		
$\frac{3}{4}$ lbs	$\frac{1}{4}$ " nails Stronghold or #S212A Maze nails		
$\frac{1}{8}$ lbs	$\frac{1}{2}$ " nails Stronghold or #S213A Maze nails		
1	$\frac{1}{4}$ x $1\frac{1}{2}$ " carriage bolt		
1	$\frac{1}{4}$ x 2" carriage bolt		
2	$\frac{1}{4}$ x $5\frac{1}{2}$ " carriage bolts		
6 yds	$\frac{1}{2}$ " wide fiberglass tape with resin		
STEERING WHEEL			
1	$\frac{3}{16}$ x $2\frac{1}{2}$ x 14" aluminum	face plate	
2	1 x $2\frac{1}{2}$ x 12" oak, maple or walnut	hand grips	
4	10-24 x $1\frac{1}{4}$ " stove bolts		
3	#8 x $1\frac{3}{4}$ " fh screws		
1	$\frac{1}{2}$ x $5\frac{1}{2}$ " bolt with slotted nut	wheel spindle bolt	

with another heavy hammer or block of steel to absorb the hammer blows. Space nails about 3 in. apart. Apply the thick mixture of glue and sawdust into the slit cut in the sponson bottom piece. These seams will be covered with fiberglass tape later.

Next, take up the clamps which were previously rip sawed to size and saw a 40° bevel along their entire length (Fig. 5B). Temporarily C-clamp them in place along the upper outside edge of the side planks as in Fig. 1 and mark the underside of the forward tip for beveling to fit against the sponson top. Remove, bevel and again C-clamp them in place. If the beveled tip fits tightly against the sponsons top, permanently fasten the clamps to the side planks with glue and 1-in. nails. The top side of the clamp will project above the side planks at the fore end and will have to be planed down, but leave this go until the deck center support batten is in-

for **fun** and more... **GO CUSHMAN.**



A distinctively styled Cushman scooter, with its dynamic performance and safe roadability puts a new lift in your life. And there's more: A Cushman scooter provides today's most economical transportation—takes you anywhere for less than a penny per mile.

- Dependable Husky 4-cycle engine
- Up to 100 miles per gallon
- New brake action for sure stops

Sold and serviced nationally

Ask your dealer for
FREE demonstration
or write for colorful booklet

**NEW! LOW COST
SCOOTER
INSURANCE**

Write: Mack & Coons
The Stuart Bldg.
Lincoln, Nebr.

The smart
1960
ROAD
KING



UTILITY
VEHICLES



The
dynamic
1960
SUPER
EAGLE

CUSHMAN MOTORS

1028 No. 21st, Lincoln, Nebraska
A subsidiary of Outboard Marine Corporation,
maker of Johnson and Evinrude outboard motors

Please send Scooter booklet.

Name

Address

City

State

WELD IN A JIFFY! IT'S DYNAMIC \$38.50 F.O.B.



Now any one can weld, cut, braze or solder almost any metal quick, safe and easy with this professional type welder. Make repairs in home or shop and farm; repair auto bodies and fenders, build wrought iron furniture railings, fences, etc.—1001 metal items. No previous experience necessary. Designed to operate on any properly wired 110 V. A.C. line. Order today! Literature on larger industrial equipment on request

EASY PAY PLAN

Low down payment. Pay as you use. Money back guarantee. Act now!

SEND ONLY \$6.00

CHECK, CASH or M.O. PAY
POSTMAN BALANCE
PLUS CHARGES 1 YEAR
GUARANTEE 10 DAY
MONEY BACK TRIAL

DYNAMIC WELDER COMPANY, 1808 S. Federal St., Dept. D5-H Chicago 16, Ill.



Get New 132 Page Catalog of WOOD AND WOODWORKING MATERIALS

WORLD'S LARGEST SELECTION—Lowest Prices
Your buying guide for finest kiln dried domestic and rare imported woods, lathes, bendings, matched plywood, mouldings, ornaments, etc. Biggest sale lists of tools and hard-to-find hardware. Packed with scroll saw patterns, projects, wood facts and money-making ideas. Enclose \$2c (refund on first order) to help pay mailing and handling costs. Write today to CRAFTSMAN WOOD SERVICE COMPANY 2729 S. Mary Street, Dept. C-7, Chicago 8, Ill.



Exclusive Double-Bearing HEAVY-DUTY PUMPS

IRRIGATE • DRAIN • CIRCULATE • SPRAY
Use 1/4 HP motor or larger 1 HP for up to 5,200 GPM; 1,000 GPM or higher up to 1,000 GPM from 3/8" well, 1 1/2" inlet; 1" outlet. Stainless shaft.
TYPE X-2 oilless bronze bearings \$10.95
Won't rust
TYPE X-3 Bell bearing model \$12.95
Postpaid if cash with order. Send for yours today.
MONEY BACK GUARANTEE
Centrifugal and Gear Pumps in All Sizes
LABAWCO PUMPS, Belle Mead 32, N. J.

FREE EICO CATALOG

Build Your Own
Hi-Fi, Radios,

Ham Gear, Test Inst., — Save 50%

Get started in ELECTRONICS the easy EICO way. No technical knowledge needed to build EICO kits. Simple step-by-step "Beginner-tested" pictorial instructions guide you all the way. LIFETIME service & calibration guarantee. Mail coupon now!



EICO, 33-00 Northern Blvd., L.I.C. 1, N.Y.
Please send FREE catalog & name of local dealer.

Name

Address

City

Zone

State

MINIATURE ENGINES GASOLINE—STEAM

BUILD THEM YOURSELF—IN YOUR OWN SHOP WITH YOUR OWN TOOLS
Anyone with a 4" or 6" lathe & drill press can make them. Also available: READY-TO-ASSEMBLE STEAM ENGINE KITS AND BOILERS
Illustrated catalog 25¢



OCURA MODELS
Box 336-SM23, PARK RIDGE, ILL.

Beauty...

backed by
**SCIENTIFIC
MARINE
ENGINEERING**



Every Penn Yan is built to scientific principles of marine design. As a result, Penn Yans are superbly maneuverable,

fast, durable and safe. They are built—as they have been for nearly 40 years—to give greater satisfaction longer.



FREE Catalog describes complete new line. Write Penn Yan Boats, Inc., 39th St., Penn Yan, N. Y.

Penn Yan Boats

Sure Insurance Against Boat Leaks!

Stay-Tite Neoprene ALL-SEAL

It prevents boat leaks—it stops boat leaks. Being a liquid Neoprene, it flows into hard-to-get-at places without requiring wood to be completely dry. Recommended as a sealer and wood-to-wood adhesive where flexibility and adhesive strength of 243 lbs. per sq. inch are desired; seals leaky windshields. Bloodproofs game bags. Sande easily. Water proof. Unaffected by oil, gas, or sunlight. In white, mahogany. In plastic squeeze bottle, \$1.80, min. \$2.95. qt. \$5.75. If no dealer nearby, order direct. Ask for complete catalog of marine products.



Stay-Tite Products Co., Inc. Dept. SM Cleveland 4, Ohio

BATTEN

7

To determine the angle at which to bevel the clamps for good contact with the decking, bend a $\frac{1}{2}$ x $\frac{3}{4}$ -in. batten (indicated by dotted lines) across the deck batten.

stalled. Lay out and cut this deck batten from a length of 1 x 4-in. stock as detailed in Fig. 5G. Fasten the two pad pieces on both sides of the fore end of the deck battens with glue and $1\frac{1}{2}$ -in. nails. Locate the fore end of the batten at the center and notch the aft end of the batten to fit in a similar notch cut in the top center of the #1 frame. Fasten batten with glue and one $1\frac{1}{2}$ -in. nail at each end.

Then plane the fore ends of the clamps, fairing them at an angle so that the deck planking will make good gluing contact. Also bevel the fore edge of the decking on the underside so it will make a good tight seam with the bottom planking. Mark and trim both sides of the planking so that it will flare outward slightly at the fore end corners.

Since it will be impossible to paint the interior of the hull covered by the deck after it is installed, give this area including the underside of the deck one coat of Penta preservative and two coats of primer. Do not paint tops of clamps, deck batten and #1 frame nor that part of deck underside that contacts these members. Instead, apply glue on these surfaces and install decking. Fasten with $1\frac{1}{4}$ -in. nails spaced 3 in. apart along clamps, batten and frame. Use 1-in. nails clinched on underside along fore edge as you did when assembling sponsons. Fill the saw slot at the center of the deck with glue and sawdust mixture.

Make up the motor board from $\frac{3}{4}$ -in. solid stock sandwiched and glued between two pieces of $\frac{1}{4}$ -in. plywood as in Fig. 5F. Bevel the bottom of the motor board and assemble to the transom with the two wooden wedges as in Fig. 5F. Fasten with three #8 x $1\frac{3}{4}$ -in. fh screws along the bottom of the board and two $\frac{1}{4}$ x $5\frac{1}{2}$ -in. carriage bolts at the top.

Make the steering wheel support as in Fig. 6B and bolt it to the #1 frame with a $\frac{1}{4}$ x $2\frac{1}{2}$ -in. carriage bolt and to the bottom plank

Everything For The BOAT

Outboard—Inboard—Sail—Game Room. Gear—Equipment—Hardware—Supplies—Jewelry—Instruments—Controls—Refrigeration. Scores of Money-Saving Boat Supplies! NEW Inboard Gasoline Diesel Engines WE TAKE YOUR OLD ENGINE IN TRADE—BY MAIL.

Send for 125 Page, Big Illustrated part color, catalog. Only \$1.99 (rebound, with first order). FREE—Floating Key Ring accompanies each catalog. Boat Equipment Unlimited, Oceanport 3, N.J.

KITBOATS Boat Plans Patterns Frame Kits



KIT CATALOGS—Over 50 Models—Pre-assembled, Runabouts, Cruisers, Fishing (8' to 15'). Anyone can assemble. Complete Marine Accessories, Fiberglass plastic, Trailers, Paint, etc. Also Catalog on 30 Modern Plans and Patterns, Prefab Frame Kits—SEND FOR 2-COLOR CATALOG

FREE FREIGHT—SAVE $\frac{1}{2}$ CREDIT TERMS CRAIG-CRAFT, Tonawanda 1P, N. Y.

MARPROX SEALERS for boat construction



SEALER "800" Rubber Mastic. Modern bedding compound. Strength with flexibility. 2 colors. SEALER "900" Liquid Rubber. Great adhesion and flexibility. Makes watertight seal. 4 colors. "LAKEFILL" Plastic Putty. For filling screw holes, dents and checks. Sand perfectly. 8 colors.

See your dealer or write—

MARINE PRODUCTS, INC., 783 Pearl Avenue, Oshkosh, Wis.

with a $\frac{1}{4}$ x $1\frac{1}{2}$ -in. carriage bolt as in Fig. 6D. A dab of paint under the head of the bolt used to fasten the steering support to the bottom plank will prevent entrance of water and eventual rotting at this point.

Finishing the Hull. First sand the entire hull inside and out with medium and fine sandpaper. Round all sharp corners so the finish will not wear thin at the edges. Apply fiberglass tape along edge where deck meets bottom planking at bow and along sponson edges. Also cover slit cut in sponson and bottom planking with fiberglass tape.

If you want a natural wood finish, give the inside and outside of the hull one coat of clear Firzite followed by two coats of marine spar varnish. If you are painting the hull, apply one coat of white Firzite followed by one coat of enamel undercoater and finish with one coat of marine enamel of the color you desire.

Steering Gear. You can bolt a purchased steerer to the wheel support or, make the "drag-type" steering wheel shown in Fig. 6A. To make the wheel, first draw a full-size layout of the face plate on heavy paper. If you fold the paper and let the crease represent the wheel centerline only half the face plate need be drawn. Cut the folded paper on the drawn lines and you will have a full size paper pattern of the face plate when the paper is unfolded. Tape the pattern on a piece of $\frac{3}{16}$ -in. aluminum and scribe around it. Cut the aluminum to shape with a coping or jig saw.

Make a full size, cardboard pattern of the hand grips (Fig. 6A) and transfer two outlines to 1-in. thick oak, maple or walnut stock. Recess the back surfaces of the hand grips to take the face plate and bolt the hand grips to the face plate with 10-24 x $1\frac{1}{4}$ fl stove bolts. Round off the corners of the hand grips with a file and sandpaper and finish with two coats of shellac and two or three applications of paste wax.

Make the steering-wheel drum from five discs cut from $\frac{1}{4}$ -in. plywood and $\frac{3}{4}$ -in. lumber as in Fig. 6C. Glue these discs together and fasten to the face plate with #8 x $1\frac{1}{4}$ fl screws. Mount the completed steering wheel to the wheel support with a $\frac{1}{2}$ -in. bolt, slotted nut and cotter pin. Rig the steering cable from wheel to outboard motor through two swivel pulleys fastened to the side planks (Fig. 1) on each side of the cockpit. Wrap cable on steering wheel drum so that it winds and unwinds at the top of the drum.

BUILDING or REPAIRING DO THE JOB RIGHT

USE KUHLS ELASTIC

GLUES CEMENTS PRESERVATIVES SEAM COMPOSITIONS

TO MAKE AND KEEP HER TRIM AND WATERTIGHT



21 GREAT Elastic PRODUCTS

- Seam Composition • No. 1 for Decks
- No. 2 for Hulls • Sealite • Seamlast
- Bedfast • Seam Paint • Canvas Cement
- "Avis" Aero-O-Nautic Liquid Marine Glue
- Trowelast • Brushlast • Patchlast
- 3-Way Preservative • Canvas Preservative
- Double Plank Cement • Woodtex (Surfboard) • Woodtex (Wood Plastic)
- Rub-R-Tex • Rub-R-Seam
- Epotex Epoxy Repair Kit • Teestrip

SEALTITE—A Rubber Base Liquid Sealer for Boats, Trailers, Homes. SEALTITE is Oil Resistant, Expands and Contracts for an absolute watertight Seal. For hard to get at open seams not wider than $1/32$ of an inch. In 4 Colors: White, Mahogany, Black, Natural.

3 NEW KUHLS Elastic PRODUCTS Flammable! Remover is today's miracle of modern chemistry. Removes Paints, Varnishes, Lacquer, Shellac, Vinyl Floor, Urushiol or any synthetic coating from Wood, Leather, Canvas, will not harm any surface or raise the grain of wood. A little goes a long way, its speedy action saves time and reduces labor costs. It cleanses thoroughly leaving a ready surface for re-painting, spraying or fiberglassing.

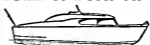
EPOTEX—Elastic EPOTEX for emergency or permanent repairs. **SEALS**—REPAIRS—BONDS. Wood, Steel, Iron, Fiberglass, Plastics.

RUB-R-SEAM—Thiokol Base 2 Parts Mixture. For deck and hull seams above and below the waterline. Bedding of laps in lapstrake construction.

FREE! BOOKLET, No. 126—Has a Composite Boat Chart. Shows what to use and where to use it. AT YOUR DEALER OR WRITE DIRECT

SINCE 1889 **H. B. FRED KUHLS** 65th Street & 3rd Ave. BROOKLYN 20, N.Y.

BUILD A BOAT AT $\frac{1}{4}$ THE COST!



with CLEVELAND'S full size, cut-to-shape boat patterns, detailed blueprints, and specifications. All classes and styles of modern Naval Architect-designed boats from $\frac{1}{2}$ to 38 ft. **BIG NEW 86-PAGE ILLUSTRATED CATALOG**, 50¢ (incl.). "How to Build a Boat" Booklet, \$2.50. Hardware & Equipment Catalog, \$2.00.

CLEVELAND BOAT BLUEPRINT CO.

Dept. SM100 Box 1651 Cleveland, Ohio

Dahmer's BIG MARINE CATALOG

82 pages, chock-full of scores of money-saving boat supplies and equipment, marine hardware, accessories, gear, instruments, marine novelties, etc. Only 35¢ postpaid. Send NOW!

Henry Dahmer, Inc. Dept. SM Keyport, New Jersey

TINY RADIO PLAYS FOR 10 YEARS!



NO TUBES—TRANSISTORS—BATTERIES OR "PLUG-INS" NEEDED

Smaller than a pack of cigarettes, 1050 model never runs down or burns out. Guaranteed to receive long distance more anytime, anywhere—without EXTRA ANTENNA! Features: 8-band tuning, 100% AM, 100% FM, wave detector, Chrome black plastic case, BUILT-IN SPEAKERPHONE—NO SEPARATE DANCING EARPHONE! American made and service guaranteed.

SEND ONLY \$2.00 (cash, a.h. m. and pay postman \$4.99 COD on arrival or mail to us). No extra to buy. Free 1000 mile antenna enclosed if you order at once.

MIOWAY COMPANY Dept. TSB-8 KEARNEY, NEBR.

WELD BRAZE SOLDER CUT **4WAY ONLY \$14.75** f.b. factory



WELDER Complete with Twin Carbon arc Torch and ac. cables... to handle all metal craft work.

Accustomed by thousands of Homeowners, Mechanics and Hobbyists as the welder of choice... from properly wired 110 volt AC or DC line. The ideal gift with a life long use. Order today on 10 day money back guarantee... only \$3.00 (add \$1.00 postman balance C.O.D. plus charges. Literature and larger equipment on request.

FOUR-WAY WELDER CO. Dept. FS-H 1810 S. Federal St. Chicago 16, Ill.

● Craft Prints in enlarged size for building hydroplanes are available at \$1.50 each. Order by print number. To avoid possible loss of coin or currency in the mails, we suggest you remit by check or money order. (No C.O.D.'s or stamps.) Now available, our new illustrated catalog of "196 Do It Yourself Plans." 10¢. SCIENCE AND MECHANICS, 450 East Ohio Street, Chicago 11, Illinois. Please allow three to four weeks for delivery.

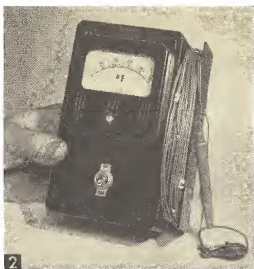


Fig. 1. Lower the probe into the water, flip the switch, and the meter instantly reads the temperature.

Fig. 2. The meter scale is labeled to read directly in degrees F. Left-handed fishermen will want to mount the wire reel on the opposite side.

Remote Reading

Electronic Fishing Thermometer

**Because the fish play it cool,
this will help you locate
the spots where they bite**

By JAMES E. PUGH

THE sensitive thermistor in the probe of this \$11 instrument will give you temperature readings down to 50 or more feet below the surface of your favorite fishing waters. That is why you can use it to answer the question, "Where are they biting today?"

Fishing experts know that fish prefer waters within a certain temperature range; the exact range depending on the species (Table A). When the fish are in a level of water at the temperature they prefer, they

are lively and will take lures readily. In warmer zones, they are more listless, often refusing bait altogether. The principle behind this fishy behavior is that any one kind of fish will seek water with the certain oxygen content that is most comfortable for him. Since the amount of absorbed oxygen in water depends largely on the water temperature (warm water holds less oxygen than cold water), the electronic remote thermometer will guide you to where your favorite fish are most likely to be found.

Preparing the Case. First lay out the hole locations on the black plastic case (Fig. 3). The arrangement of the wire reel shown in Fig. 2 is for right-handed fishermen. Southpaws should simply change the reel to the left side and the battery to the right. When you drill the holes, back up the underside of the case with a wooden block to prevent chipping. Use a circle cutter on a drill press to make the 2½-in. hole for the meter. Without a circle cutter, scribe the hole and drill a ¾-in. hole just inside the circle. Then cut this section with a fine coping saw, and trim the hole with a fine half round file to fit the meter case exactly.

Next solder the junction of rivets and lugs on the battery holder (Fig. 4) to avoid possible trouble with a high resistance joint in the future. Also coat the inside surface of

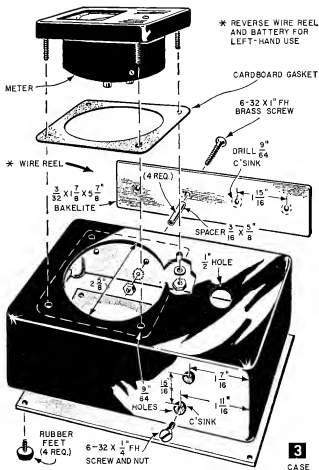
the rivet with solder where it contacts the battery, to avoid corrosion from battery leakage. Then mount the other parts and solder all connections (Fig. 5).

Be sure that your soldering iron is hot and clean, and use only rosin core solder. Apply the hot iron and a very small bit of solder to the joint at the same time. The layer of solder provides heat contact with the joint. After a moment when the joint is hot apply more solder. Remove the meter lugs when soldering to prevent damage to the meter, and use heat sinks to keep the small resistors cool.

Although our model is shown with 50 feet of cable you can use any length to suit local needs. Tie one end of the cable to one of the reel spacers (Fig. 5A) allowing about 1-ft., to pass through the grommet into the case. Solder the connections and wind up the length of cable on the reel.

Testing Meter Wiring. To check the work so far, strip about $\frac{1}{4}$ -in. of insulation from the probe end of the cable. Place the battery in its holder and with the bare ends of the probe wire well separated, immerse them in a glass of water. The meter pointer should move upward on the scale, the amount of movement depending on the impurity of the water. If the meter reads backward, your battery is reversed in the holder. Remember that the positive terminal of this battery is not the same as that of a flashlight cell. Mercury cells have a positive shell and a negative center. Mark the positive terminal lug of the battery holder with a dab of nail polish, or red paint.

Making the Probe. With a fine coping saw,



cut the threaded end off the lower half of a plastic ball point pen casing. Drill eight $\frac{1}{16}$ -in. holes around the pointed end (Fig. 6). Then shape a $2\frac{1}{8}$ -in. length of wood dowel so it fits snugly into the casing with about $\frac{1}{2}$ -in. projecting. You can turn a dowel down to the diameter needed by chucking it in an electric drill and removing excess wood with sandpaper. Carefully drill a $\frac{3}{8}$ -in. hole through the dowel, working from both ends to keep the hole centered. Notch the tapered end of the dowel (Fig. 6) to seat the plastic probe cable. Push the cable through, tie a single knot and dress the ends, tinning them with solder.

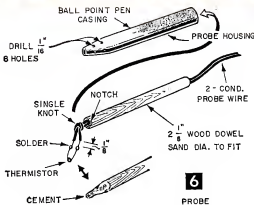
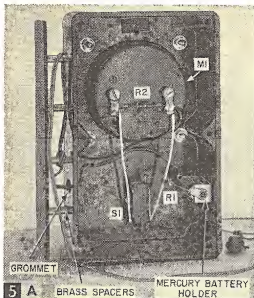
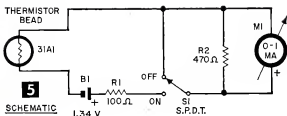
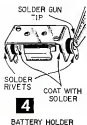
Handle Thermistor Carefully. Remove the thermistor from its shipping box and place it on a clean white paper so it can be seen. It is so small it can easily be lost. With the thermistor laying on the paper, hold one of the cable ends against one of the tiny leads. Use a small tweezer as a heat sink to keep soldering heat from damaging the thermistor, carefully touching your clean soldering iron tip to the wire until the solder melts.

MATERIALS LIST—ELECTRONIC FISHING THERMOMETER

Part/ No. Req.	Size and Description
B1	1.34-volt mercury cell, Mallory RM-401R (Lafayette BA-239)
M1	0-1 ma. D.C. milliammeter (Lafayette TM-60)
R1	100 ohm, $\frac{1}{2}$ watt, 10% carbon resistor (Lafayette RS-10)
R2	470 ohm, $\frac{1}{2}$ watt, 10% carbon resistor (Lafayette RS-10)
S1	SPDT toggle switch (Lafayette 8282k24)
TH	1250 ohm thermistor, Vaco 31A1 (Lafayette 31A1)
1	$6\frac{1}{4} \times 3\frac{3}{4} \times 2$ " Bakelite case (Lafayette MS-216)
1	panel for Bakelite case (Lafayette MS-217)
1	holder for RM-401R Mercury cell (Lafayette MS-388)
50'	miniature parallel cable, Belden 8782 (Newark Electronics 36F105B)
4	$\frac{1}{2}$ " rubber feet (Lafayette P-249)
1	On-Off switch plate (Lafayette 827-228F3)
1	#1-33 wire markers, Brady B-500 (Newark 30F200)
1	#34-66 wire markers, Brady-500 (Newark 30F201)
Misc	machine screws, nuts, metal spacers, wood dowel, ball point pen casing, cement, sheet Bakelite, cardboard gasket, plastic electrical tape, wire and rosin core solder

Fig. 4. Solder the terminal rivets and also coat the contacts to prevent corrosion. Mark the positive terminal to insure correct battery polarity.

Fig. 5. Because the ohmage of thermistors varies in manufacture, you may need to alter the values of R1 and R2. See text.



After the joint is cool, with a needle or small probe gently bend the other thermistor lead until it lays parallel to the first one. Solder as before. Then carefully ease the bead end of the thermistor into a point about $\frac{1}{8}$ -in. across, so it projects straight forward from the section of wire feeding into the wood dowel.

Testing the Thermistor. Now with the battery in the holder and the switch on, the meter should read about $\frac{3}{4}$ full scale. If the pointer

doesn't move, one of your leads is not perfectly soldered. Resolder, noting that the meter should deflect when a good joint is obtained. Blow lightly on the thermistor and the reading should change.

Waterproofing Probe. Coat about 3 inches of the probe cable with polystyrene coil dope, or model cement. Pull the cable, wet with the cement, back into the dowel until the knot rests firmly against the notched end and allow to dry for several hours. Then dip the thermistor and connections in the cement and dry for at least an hour. Apply additional coats and dry overnight. Then rub paraffin or beeswax on the wood dowel and insert gently into the plastic casing, so that the thermistor tip is slightly below the upper four holes in the tapered end. Now apply the adhesive wire markers to indicate each foot of depth on the cable.

Calibrating the Meter. Take the meter out of the plastic case, and remove the four tiny screws from the rear of the front flange. Working in a clean dust-free place, carefully take the cover off and apply numbers left over from the wire marker set, to the dial, so that your meter reads from 0 to 100. Then letter "degrees F." on a narrow strip of white adhesive tape and place it over the MA label on the meter face. Replace meter in case and reinstall using the waterproofing gasket (Fig. 3).

Remove the plastic probe cover and gently lay the tip of the probe against an ice cube. The meter should read 32. Now heat some water to 90° F, immerse the probe in it, and note the meter reading. Cool the water to 80° and check the meter reading. Repeat at each 10° step down to 40. The meter should indicate the correct water temperature within $\pm 2^\circ$ from 32 to 80°. Above 80° the error becomes slightly higher.

If the meter reading is more than 1° off at 32 and 70° it can be corrected by changing the value of R1 and R2. To do this, simply change R2 to cause the reading to be correct at 32°, and R1 to give a correct reading at 70°. Use a smaller value R2 to decrease the reading near 32° and a larger value R1 to decrease the reading near 70°.

Since these two resistors interact it may be necessary to change them alternately until the correct readings are obtained. If you

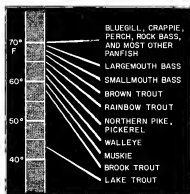
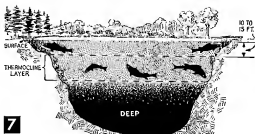
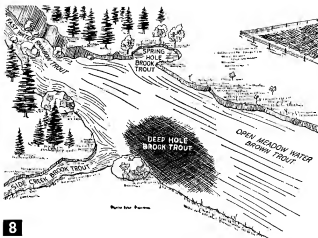


TABLE A.
Typical feeding temperatures.

8



7

wish, these two fixed resistors can be replaced with variable controls. Replace R1 with a Mallory Type U-2, 500 ohm control, and R2 with a Mallory Type U-4, 1000 ohm control—both available at Lafayette Radio.

Seal the rear surface of the meter flange and the bottom cover of the case with plastic tape. Cement the meter movement adjustment screw on the front and the instrument is completed.

How Circuit Works. The temperature sensing probe is a special kind of resistor known as a thermistor. When this fast-acting thermistor is heated its resistance goes down, and when it is cooled its resistance goes up. Wired in series with the meter and battery it will cause the meter to read lower as the temperature becomes lower, and higher as the temperature becomes higher. The meter reading therefore shows the temperature at the probe.

Resistors R1 and R2 proportion the current so as to give a convenient meter reading, and switch S1, in the Off position, damps the meter movement to prevent damage to the pointer while the unit is being carried.

Fishing Hints. The several fishing sinkers to the cable just above the probe. Allow enough string so they hang below the probe to prevent damaging it. Lower the probe into the water and turn the switch on. Almost immediately the meter will indicate temperature. As the probe sinks down, temperature will normally decrease gradually for the first 10 to 15 feet. Then, you'll go through a second

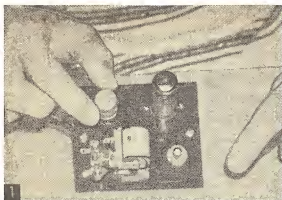
thermocline layer where the temperature drops more rapidly, followed by a third layer which reaches to the bottom and again decreases slowly in temperature (Fig. 7). This is the normal pattern for quiet lakes, ponds and rivers. Near currents, springs and disturbed water, the pattern will take another form.

Now you can make a plot of your fishing spot, being on the lookout for cool springs that can easily be tracked down to their point of entry by following colder than normal areas back to their origin. Near such cool springs, many fish such as muskie gather on hot days. Drop your line in such a spot and they'll bite often.

Other places to check are river openings and spots where deep depressions have been formed on the bottom by currents (Fig. 8). Such deeper water will be cooler and thus more attractive to fish on hot days. After you plot your spots, noting the temperature where fish bite the best, you'll be able to go back any day, hot or cool, and get results after spot checking the temperature.

The exact temperature range preferred by various species will vary from Table A when local conditions are unusual. For example, rushing water will contain more oxygen than still water, and therefore, the fish will seek a warmer temperature. Also, when barometric pressure is high, the water will absorb more oxygen. When the barometer is high, the fish will seek a warmer range and when the pressure is heavy and depressing, they will prefer a cooler temperature.

Clip the chart from the page, and fasten it to the back of your thermometer case with tape and a few coats of varnish. The tiny mercury battery should last for over 800 hours, and since its output is constant at 1.34 volts, your readings should remain accurate throughout the season. But at season's end remove the battery to avoid damage due to battery leakage.

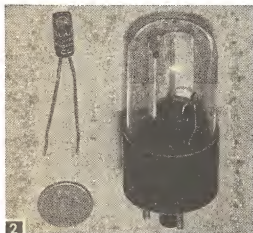


Pressing one finger over crystal cell actuates control relay in dim room light. Adjustment of potentiometer knob provides wide range of light sensitivity.

A CADMIUM sulphide crystal small as a transistor forms the heart of this compact photo-electric switch designed especially for light control applications requiring high output voltage or current at very low light levels.

The unit, known as the Clairex crystal photocell, needs only a fraction of a footcandle of illumination to fire the cold cathode discharge tube and, thus, operate the control relay. The cell is a plastic vial $\frac{1}{4}$ in. dia x $1\frac{1}{4}$ in. long (Fig. 2). A transparent window in one end reveals the amber crystal with a sensitive surface barely $\frac{1}{32}$ x $\frac{3}{32}$ in. With $\frac{1}{32}$ dia. x $1\frac{1}{4}$ -in. pigtail leads provided, you can wire it into a circuit as you would connect a small capacitor.

Assembled in chassis form (Fig. 1), the switch will mount in a cabinet as small as $3\frac{1}{4}$ x $3\frac{1}{2}$ x $3\frac{3}{4}$ in. because there are no power



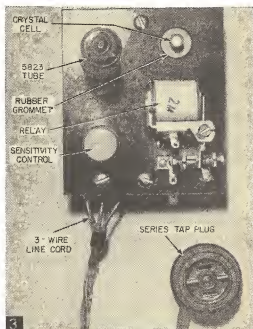
Crystal photocell is about 1/50th the size of its vacuum tube counterpoint, but comparison tests indicate it to be 50 to 100% more sensitive. Compare size with penny.

Crystal Photo-Control Switch

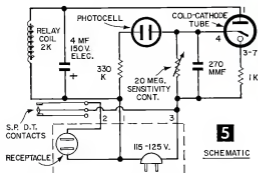
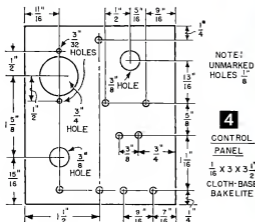
By THOMAS A. BLANCHARD

transformers, voltage-dropping resistors or rectifiers. The circuit generates no heat and it draws no current from the power line except when the photocell is exposed to light.

Construction. Make the chassis (Fig. 3) from a piece of non-conductive material (such as $\frac{1}{16}$ -in. linen base Bakelite or non-hygroscopic fiber) following dimensions and hole locations shown in Fig. 4. Holes for mounting the relay are expressly for the Sigma Type 4F. You can substitute Potter & Brumfield, Guardian or Advance relays with similar coil and sensitivity characteristics if



Crystal light switch assembled on a 3 x $3\frac{1}{2}$ -in. bakelite panel. Special plug at lower right provides both operating and control voltages.



you modify mounting arrangements.

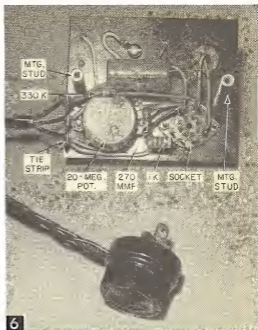
Secure the relay with two $\frac{1}{8}$ -in. x 6-32 binding head screws, with a soldering lug under one to establish contact with the relay armature. Attach the 3-lug tie strip with a $\frac{1}{4}$ -in. x 6-32 binding head screw and nut. Mount a 7-pin wafer socket on 1-in. centers with two *rh* $\frac{1}{4}$ -in. x 2-56 machine screws and nuts. Fasten the $\frac{1}{4}$ x 1-in. mounting studs with $\frac{1}{4}$ -in. x 6-32 binding head screws. A single $\frac{3}{8}$ hex nut will hold the 20 meg. potentiometer.

Insert a $\frac{3}{8}$ -in. O.D. x $\frac{1}{2}$ -in. I.D. rubber grommet in the $\frac{3}{8}$ -in. hole adjacent to the socket hole and press the crystal photocell into the grommet. The cell will remain firmly in place in this shockproof mount.

Wiring. You need less than a foot of regular hook-up wire since the component pigtail leads suffice for most of the wiring (Figs. 5 & 6).

Note use of the #2 lug of the tube socket as a tie-point for one side of the photocell and its 330K series wired protective resistor. This lug is not a functional part of the #5823 tube. Only lugs 1, 4, 3 and 7 connect to tube elements, and #3 and #7 are internally connected together which explains why pictorial plan shown in Fig. 7 has no connection on #3.

The special line cord is not installed until



Rear view shows all components terminating at rigid tie points, bare leads insulated with spaghetti radio tubing. Threaded studs are for cabinet mounting.

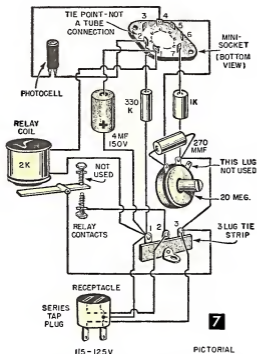
all other wiring has been completed. This poses no problems since all power and operating connections terminate on the 3-lug tie strip.

To eliminate the need for a large screw type terminal strip for power and relay contact connections, use a simple 3-wire extension cord system. The nucleus of this cord arrangement is the combination line cord plug and receptacle. When plugged into the power line, the pins deliver voltage to operate the control. The third cord wire connects through the relay contacts and returns to the receptacle cap on the plug. Thus any 115-125v. device plugged into the cap will operate when light strikes the crystal photocell.

If you want to use the control with devices operating on d-c voltages lower and isolated from the power line, substitute an ordinary 2-wire fixture cord making connections to tie lugs #1 and #3 only. Remove the relay wires from lugs #2 and #3 of tie strip and connect directly into the low voltage operating circuit.

The normally open or "back contact" of the relay is not used in this design. However, both stationary contacts may be wired up to perform separate short interval functions: to start or stop any device when a ray of light reaches the Clairex cell.

Three twisted leads make up the line cord, but you can use a flat 3-conductor plastic zip

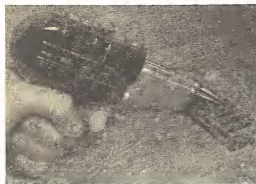


cord stocked by larger electrical (not radio) jobbers. Widely used in electric heating pads and thermostat hook-ups, this cord is like ordinary fixture cord except for an additional wire.

Operating Tips. Because of the exceptional sensitivity of this control, you will have difficulty adjusting the 20 megohm potentiometer for precise pick-up and drop-out of relay con-

Inverted Brush Cleans Gun's Tip

- To keep the tip of your soldering gun clean of scale, woodscrew-fasten a brass-bristle



suede shoe brush to one end of your workbench. Wipe the soldering-gun tip across the brush occasionally to keep it clean for efficient soldering.—J.A.C.

MATERIALS LIST—PHOTO-CONTROL SWITCH

No. Req.	Size and Description
1 pc.	$\frac{1}{16} \times 3 \times 3\frac{1}{2}$ " bakelite or fiber panel
2	$\frac{1}{4} \times 1"$ bushings threaded 6-32, for spacers
2	$\frac{1}{4} \times 2-56$ rh machine screws and nuts
2	$\frac{1}{8} \times 6-32$ binding head machine screws
3	$\frac{1}{4} \times 6-32$ binding head machine screws
1	6-32 nut
1	#6 soldering lug
1	$\frac{3}{8}$ O.D. $\times \frac{7}{16}$ I.D. rubber grommet
1	3-lug tie strip
1	7-pin miniature wafer socket, mounting holes 1" centers
1	RCA special purpose cold cathode discharge tube #5823*
1	Type CL-2 Clairex crystal photocell (Clairex Corp., 19 W. 26th St., New York 10, N. Y.)
1	4 mfd., 150 WV electrolytic capacitor (Cornell-Dubilier #BR-415)
1	270 mmf. C-D ceramic capacitor
1	2K ohm relay (Sigma #4F)
1	$\frac{1}{2}$ watt, 330K (330,000) ohm resistor
1	1 watt 1K (1000) ohm resistor
1	10 megohm IRC Potentiometer Type RQ (screwdriver slotted short shaft) or Type PQ ($\frac{1}{4} \times 3"$ round shaft)
1	Woodwin plug #889 (Wood Electric Corp., Glendale, L. I., N. Y.)

* Available from Allied Radio, 100 N. Western Ave., Chicago 80, Ill., if not stocked locally.

tacts unless the control is first mounted in a cabinet. Drill a hole not more than 1-inch in diameter in the cover directly opposite the panel location of the crystal photocell. The sensitivity rises as resistance increases between the starter and cathode of the #5823 tube. As you rotate the potentiometer knob from zero to maximum, smaller light values will be required to trigger the circuit.

While the control shown in Fig. 2 is fitted with a knob, more precise adjustments for sensitivity are possible if your potentiometer has a short shaft slotted for a screwdriver. A small hole in the control cabinet permits this adjustment with the door closed.

Soldering Flux Dispenser

- You can keep that can of soldering paste flux clean and make it last longer if you punch a small hole in the lid to receive the tip of a wire or wire solder. When you insert the tip into the hole and withdraw it, a small amount of the flux will adhere—in just the right quantity for radio work.—JOHN A. COMSTOCK.



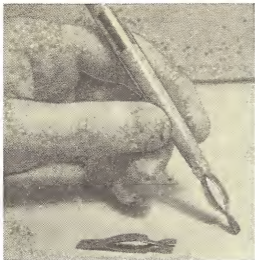
Foil Reflects Iron's Heat

- Ever melt the wax out of a paper capacitor or damage other components when soldering wires nearby? To prevent overheating adjacent parts in a radio circuit with heat radiated from your iron, shield them with a piece of aluminum foil, which will reflect most of the heat.—J.A.C.



Soldering "Pen" Absorbs Heat

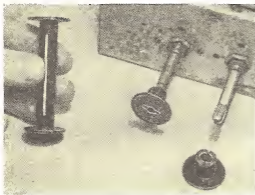
• Soldering iron heat can ruin transistors and other small electronic parts, unless you use a heat sink. Pliers are often too bulky and heavy for the job, especially in the corners of chassis wiring, or working on minia-



turized circuits. Remove the ink cartridge from an old ball point pen, and saw off the tip about 1/2-in. from the end. Then heat the back end of a Mueller #88 test clip and force it into the pen handle. A drop of cement completes this handy tool.

Film Spools Make Radio Knobs

• You can make push-up plastic knobs for your radio and electronic projects at no cost, by using discarded size 120 film spools. Saw the plastic spool flanges off at the end of the film slot. If necessary, enlarge the inside with



a drill equal to your control shaft diameter. For neater appearance, fill the hole in the face with plastic wood and paint black.

BECOME A RADIO TECHNICIAN

For ONLY \$26.95

BUILD 20 RADIO CIRCUITS AT HOME

with the New
Progressive Radio "Edu-Kit"®
ALL Guaranteed to Work!

A COMPLETE HOME RADIO COURSE

- BUILD**
- 12 RECEIVERS
 - 3 TRANSMITTERS
 - SIGNAL TRACER
 - SIGNAL INJECTOR
 - CODE OSCILLATOR
 - SQ. WAVE GENERATOR
 - AMPLIFIER

- No Knowledge of Radio Necessary
- No Additional Parts or Tools Needed
- Excellent Background for TV



FREE Set of Tools, Pliers-Cutters, Tester, Soldering Iron, Alignment Tool, Wrench Set.

WHAT THE "EDU-KIT" OFFERS YOU

The "Edu-Kit" offers you an outstanding PRACTICAL HOME RADIO COURSE at a rock bottom price. You will learn radio theory, construction and servicing. You will learn how to build radios, using regular schematics; how to solder and wire in a professional manner; how to service and trouble-shoot radio. You will learn how to work with punched metal chassis as well as the new Printed Circuit chassis. You will learn the principles of RF and AF amplifiers and oscillators, detectors, rectifiers, test equipment. You will learn and practice code, using the Progressive Code Oscillator. You will build 20 Receiver, Transmitter, Code Oscillator, Signal Tracer, Square Wave Generator, Amplifier and Signal Injector circuits, and learn how to operate them. You will receive an excellent background for TV. In brief, you will receive a home education in Electronics and Radio, worth many times the small price you pay, only \$26.95 complete.

PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" is the foremost educational radio kit in the world, and is universally accepted as the standard in the field of electronic training. The "Edu-Kit" uses the modern educational principle of "Learn by Doing." You begin by building a simple radio. Gradually, in a progressive manner, and at your own rate, you construct more advanced multi-tube radio circuits, learn more advanced theory and techniques, and do work like a professional radio technician. These circuits operate on your regular AC or DC house current.

THE KIT FOR EVERYONE

You do not need the slightest background in radio or science. The "Edu-Kit" is used by young and old, schools and clubs, the Armed Forces Personnel and Veterans Administration for training and rehabilitation.

One of the most important aspects of the "Edu-Kit" is the Consultation Service which we provide. We welcome students to send us their problems, whether related to any of the material covered in the "Edu-Kit" course, or encountered in other experiences in the field of electronics.

THE "EDU-KIT" IS COMPLETE

You will receive all parts and instructions necessary to build 20 different radio and electronic circuits, each guaranteed to operate. Your kit contains tubes, tube sockets, variable, electrolytic, switches, etc. In addition, you receive Printed Circuit materials, including Printed Circuit Chassis, special tube sockets, hardware and instructions. You also receive a useful set of tools: pliers-cutters, an alignment tool, professional electric soldering iron, wrench set, and a self-powered, dynamic Madeo and Electronics Tester. The "Edu-Kit" also includes code instructions and the Progressive Code Oscillator. You will also receive lessons for servicing with the Progressive Signal Tracer and the Progressive Signal Injector, a Much, Finestly Guide, FCC Amateur License Training Book, and a Quiz Book.

All parts, components, etc., of the "Edu-Kit" are 100% unconditionally guaranteed, brand new, carefully selected, tested and matched. Everything is yours to keep. The complete price of this practical home Radio and Electronics course is only \$26.95.

TROUBLE-SHOOTING LESSONS

You will learn to trouble-shoot and service radios, using the professional Signal Tracer, unique Signal Injector, and the dynamic Madeo and Electronics Tester. Our Consultation Service will help you with any technical problems.

J. Stankakis, of 23 Poplar Pl., Waterbury, Conn., writes: "I have received your kit. I am very pleased with it. I have sent you a picture of my friends, and made money. The "Edu-Kit" has paid for itself. I was ready to spend \$240 for a course, but I found your ad and sent for your kit."

FREE EXTRAS

• Set of Tools • Radio Book • Radio and Electronics Tester • Electric Soldering Iron • Pliers-Cutters • Alignment Tool • Tester • Restoration Book • Hi-Fi Book • TV Book • Club Membership in Radio-TV Club • Consultation Service • FCC Amateur License Training • Printed Circuitry • Certificate of Merit • Valuable Discount Card • Wrench Set

UNCONDITIONAL MONEY-BACK GUARANTEE

ORDER FROM AD—RECEIVE FREE BONUS RESISTOR AND CONDENSER KITS WORTH \$7.00

- ☐ "Edu-Kit" Postpaid. Enclosed full payment of \$26.95.
☐ "Edu-Kit" C.O.D. I will pay \$26.95 plus postage.
☐ Send me FREE additional information describing "Edu-Kit."

Name
Address

PROGRESSIVE "EDU-KITS" INC.
1186 Broadway Dept. 562C Hewlett, N. Y.

Bonus Blueprint No. 2



Two control knobs on the front panel adjust volume and sensitivity. The 4-ft. loop will detect large metal objects at 10-ft. maximum range.

By C. L. HENRY

WHEN the muddy water closes over the expensive camera or binoculars someone dropped overboard—or the silt hides the outboard which flipped off the transom—even a skilled skindiver may not be able to find them.

But this locator can do it with ease. Lower the sensitive detector loop in the water, and as it nears the metal object, a change in the loudspeaker tone pinpoints the object's location.

You can hear the detector tone even when the outboard motor is running, because the loudspeaker delivers almost a full watt of audio power.

With the loop shown in Fig. 1, our model was tested with 100 feet of cable. The unit will, how-

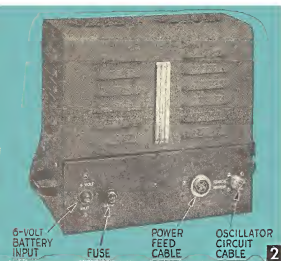
ever, perform down to depths of 500 feet, if you want to add additional cable. Power is supplied by a 6-volt auto battery, which will operate the unit for about 100 hours of intermittent service. The materials for this unit total from $\frac{1}{10}$ to $\frac{1}{2}$ the cost of various commercial units. This detector will not only save hours of searching time, but it can also pay for itself the first time it's used. And it works equally well in salt or fresh water.

Before we forget, there's a \$25 prize which will go to the first reader who sends in a closeup action photo of the completed unit, together with a letter describing his experience in building and testing the metal detector from these plans. Date of postmark on the letter determines the winner.

Connectors for power, and the two lines which feed down to the loop oscillator are grouped on the back of the chassis.

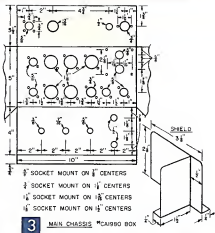
Underwater METAL LOCATOR

This electronic detective is ideal for either salvage work or treasure hunting



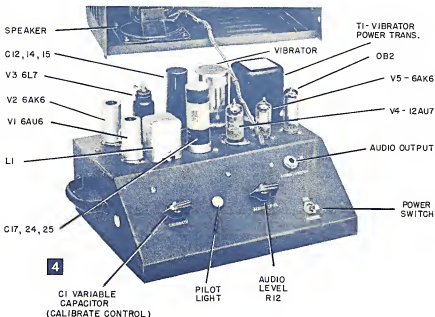
Copyright 1960 by
Science and Mechanics Magazine
450 East Ohio Street
Chicago 11, Illinois

Battery Powered, Underwater METAL DETECTOR



Construction of this beat oscillator-type metal detector starts with the main chassis (Fig. 4.) Locate all of the chassis holes (Fig. 3) with a rule and scribe. Punch the socket holes with a chassis knockout, or use a fly cutter on a drill press. Weatherproof the speaker by spraying with five or six light coats of plastic spray, and then mount it in the right front of the chassis cover (Fig. 4). Mount the parts as shown in Fig. 5 with the controls on the sloping front. On the rear, mount the fuse holder, and the connectors for the battery and search remote cables (Fig. 2).

Chassis wiring (Fig. 6) is not criti-



cal, but be sure that you keep the audio input and output separated. Also, isolate the oscillator wiring away from the rest of the wiring as much as possible. Run a bus of heavy copper wire for all ground connections. Spray completed wiring with acrylic plastic.

Mount the loop oscillator on two pieces of sheet aluminum (Fig. 7), fastened together with self-tapping screws. The assembly fits into the waterproofed plywood box (Fig. 7A). Wiring of the loop oscillator is isolated from the control unit in the boat, so the wiring of the oscillator is not critical. For extreme depths, add a valve stem for pressurizing the box.

Making the Detector Loop. The 4-ft. underwater loop is a giant sandwich made of three marine plywood rings (Fig. 8A) fastened together with Weldwood Cement, or an equivalent waterproof marine glue. For temporary fastening, use small wood screws that can be removed later.

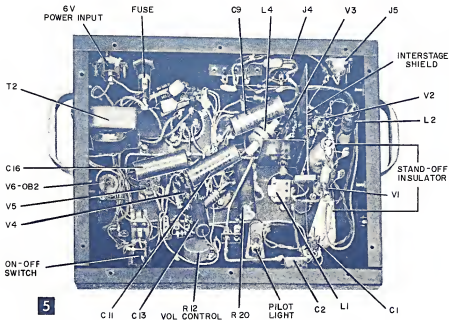
When the glue is completely dry, wind 22 turns of #12 thermoplastic-insulated solid copper wire (commonly used for home wiring) into the loop. Bring out a tap at the 5th turn

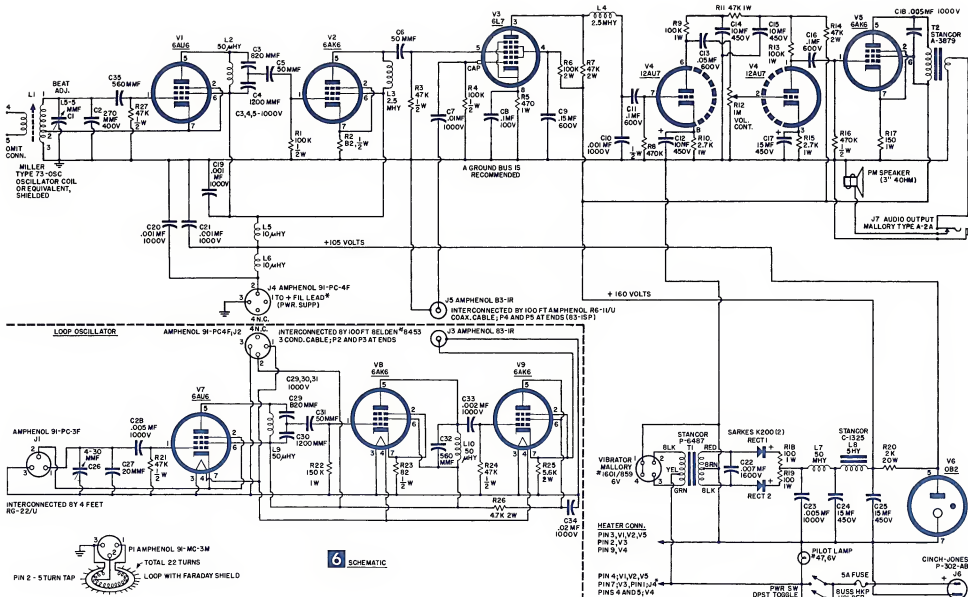
(Fig. 8, Sec. A-A). Make the winding as tight as possible to prevent shifting when the equipment is jarred in use. Winding loosely causes unstable loop performance.

Splice the two leads and the tap of the loop to 4 feet of RG-22 3-conductor coaxial cable, and extend this cable out through a Pyle National (or equal) cable feed-through. Later when you coat the entire loop with fiber glass, build up the feed-through connection as in Fig. 8, Sec. A-A.

Since the loop is part of the oscillator circuit, it must be shielded against stray electromagnetic and capacitive effects. Add a Faraday shield by making a winding of #20 bare copper wire completely around the loop (Fig. 8B). Space the turns about 1-in. apart. Then pull a piece of #20 bare copper wire through these windings on the inside of the loop. Now solder this wire to each turn of the first winding (Fig. 9). Cut the outside of each turn and fold the wire back into the loop rim so that there are no closed turns or loops around the ring. This completes the Faraday shield.

Testing the Oscillators. Before you





waterproof the loop, check out your wiring. Plug your main chassis into a hot shot or storage battery, and check the power supply voltages with a voltmeter 250 V scale (see Table A). Use a broadcast radio to check the oscillator operation. It should pick up a signal at about 800 kc. you may have to run a wire out of the oscillator to get a signal strong enough to be heard. Then check the audio section

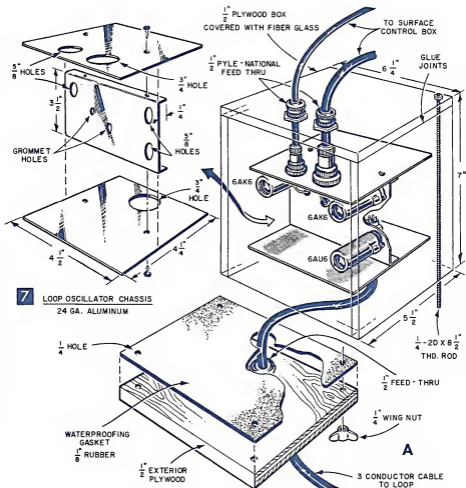
by touching the plate of the 6L7 with a screwdriver. This should cause a loud noise in the speaker with the volume about half way up. If the oscillator fails to operate, you can find the trouble quickly by checking your voltages and resistances against the chart (Table A). A working oscillator should show a bias voltage of at least 3 volts.

Now connect the loop oscillator to

the loop with the coax cable. (The length of this cable must be exactly 53-in.). Connect the oscillator to the control unit, and use your broadcast receiver as before to determine whether the oscillator is functioning. The frequencies of the two oscillators should be fairly close to one another. Adjust C1 and C28 for a beat. The beat note should be loud; probably you'll find several beats in the adjust-

ment. The loudest is the right one to use.

If you can't find a beat, follow this procedure exactly. First remove C2 and replace with a 50 mmfd mica capacitor. Adjust C1, C26 and the slug in L1. If you have no luck, replace C2 with a 100 mmfd capacitor and try again to find a loud beat. Continue the process adding 50 mmfd each time until a loud beat is found.



With both oscillators running, you can check your loop (out of water) for these results with metal targets:

SENSITIVITY

object	distance
aluminum boat	10 feet
5 gallon can	5 feet
14-in. aluminum pan	4 feet
quart can	2 feet
flashlight battery	2 inches

Waterproofing the Loop. If your unit now performs with equal sensitivity, you are ready to finish construction. Cover the loop completely with 3-in. fiber glass tape and resin. Be sure to build up many coatings of fiber glass to strengthen the area around the coax feed-thru (Fig. 8).

Mount three eyebolts on the loop

and attach three 66-in. pieces of 3/8-in. manila or nylon rope. Tie these lines to the cables and the line which feeds up to the boat, so that the loop is held horizontally in the water (Fig. 8C). Now permanently connect the loop to the loop oscillator. Be sure after you make the three connections to the loop oscillator box, that the plywood and the connectors are completely waterproofed with the fiber glass materials. The tubes will rarely require replacement.

Since your loop has an airspace between the wire and the fiber glass, it will not sink. Cut two holes in the outside of the fiber glass, and with the loop leaning against a wall, pour in loose sand or a thin mixture of cement. After the air space is filled, the loop will weigh about 45 pounds and will

MATERIALS LIST—UNDERWATER METAL DETECTOR

No. Req'd.	Size and Description	No. Req'd.	Size and Description
1	C1—variable air capacitor, 1.5 to 5 mmfd, Johnson type SM11, Allied 75H175	2	J2, J4—Amphenol type 91-PC4F, Lafayette 91PC4F
3	C2—mica capacitor, 270 mmfd/400 v, Allied 12L479	1	J5, J5—Amphenol type 83-1R, Lafayette 831R
3	C3, C25—ceramic capacitor, 520 mmfd/Lafayette C601, 1000 v	1	J6—power connector, Cinch-Jones type P-302-AB, Lafayette P302AB
2	C4, C30—ceramic capacitor, 1200 mmfd/Lafayette C601, 1000 v	1	J7—audio output jack, Mallory type A-2A, Allied 41H053
3	C5, C6, C31—ceramic capacitor, 50 mmfd/Lafayette C601, 1000 v	1	J8—vibrator power transformer, Stancor type P-6487, 170 volts OC at 50 MA.
1	C7—ceramic capacitor, 0.01 mfd/Lafayette C601, 1000 v	1	Lafayette P6487
1	C8—paper capacitor, 0.1 mfd/200 v, Lafayette Z503	1	T2—audio output transformer, Stancor type A-3879, Lafayette A3879
1	C9—paper capacitor, 0.15 mfd/600 v, Mallory GEM, Lafayette Z581	2	Rect 1, Rect 2—silicon rectifiers, Sarkes type K200, Lafayette R40
1	C10, C19, C20, C21—ceramic capacitor, 0.001 mfd/1000 v, Lafayette C601	1	vibraton—intergrator type, Mallory type Z601, RES, 6 V, Lafayette 1601, 859
2	C11, C16—paper capacitor, 0.1 mfd/600 v, Mallory GEM, Lafayette Z580	1	power switch—DPST (DPST only function used) heavy duty switch, Lafayette SW22
1	C12, C14, C15—electrolytic capacitor, triple section, Mallory type FP, 10-10-10 mfd/450 v, Lafayette Z1050	1	fuse holder—Buss type HKP, with 5 amp fuse, Lafayette HKP and Lafayette 31200S (fuse)
1	C13—paper capacitor, 0.05 mfd/600 v, Mallory GEM, Lafayette Z576	1	V1, V7—vacuum tube, type 6AU6
1	C17, C24, C25—electrolytic capacitor, triple section, Mallory type FP, 15-15-15 mfd/450 v, Lafayette Z1050	4	V2, V5, V8, V9—vacuum tube, 6AK6
1	C18—ceramic capacitor, .005 mfd/1000 v, Lafayette C601	1	V3—6L1
1	C22—paper capacitor, buffer type, .007 mfd/600 v, Lafayette Z652	1	V4—12AU7
2	C23, C26—ceramic capacitor, .005 mfd/1000 v, Lafayette C601	1	V6—gas regulator tube, type 0B2
1	C26—ceramic trimmer capacitor, 4 to 30 mmfd, Lafayette 6335E		
1	C27—ceramic capacitor, 20 mmfd, Lafayette TC220		
2	C35, C36—mica capacitor, 560 mmfd, Allied 12L335		
1	C33—ceramic capacitor, .002 mfd/1000 v, Lafayette C601		
1	C34—ceramic capacitor, .02 mfd/1000 v, Lafayette C603		
2	R1, R4—carbon resistors, 100 K, 1/2 W, Lafayette RS10		
2	R2, R23—82 ohms, 1/2 W, Lafayette RS10		
3	R3, R21, R24, R27—37 K, 1/2 W, Lafayette RS10		
1	R5—470 ohm, 1 W, Lafayette RS11		
1	R6—100 K, 2 W, Lafayette RS12		
7	R7, R14—47 K, 2 W, Lafayette RS12		
2	R8, R16—470 K, 1/2 W, Lafayette RS10		
9	R9, R13—100 K, 1 W, Lafayette RS11		
2	R10, R15—2.7 K, 1 W, Lafayette RS10		
1	R11—47 K, 1 W, Lafayette RS11		
1	R12—volume control, carbon potentiometer, 1 M, Mallory, Lafayette US2		
1	R17—150 ohm 1/2 W, Lafayette RS11		
2	R18, R19—100 ohm 1/2 W, Lafayette RS10		
2	R20—wirewound resistor, 2 K/20 W, Lafayette 2D		
1	R22—carbon resistor, 150 K/2 W, Lafayette RS11		
1	R25—5 K/2 W, Lafayette RS12		
1	R26—4.7 K/2 W, Lafayette RS12		
1	L1—universal shielded oscillator coil, Miller type 73-OSC, Allied 60H752		
4	L2, L7, L9, L10—RF choke, 50 microhenries, Lafayette R33		
1	L3, L4—RF choke, 2.5 millihenries, Lafayette R100		
1	L5, L6—RF choke, 10 microhenries, Lafayette R33		
1	L8—power supply filter choke, S henries, Lafayette C1325		
1	P1—loop connector, Amphenol 91-MC3M, Lafayette 91MC3M		
2	P2, P3—power connectors for loop oscillator, Amphenol type 91-MC4M, Lafayette 91MC4M		
2	P4, P5—loop oscillator coaxial cable connectors to control unit, Amphenol type 83-1SP, Lafayette 831SP		
1	P6—power cable connector to battery, Cinch-Jones S-302-CCT 2 contacts, Lafayette S302CCT		
1	J1—Amphenol type 91-PC3F, Lafayette 91PC3F		

TABLE A—TROUBLE SHOOTING CHART
(all readings to ground)

pin	dc volts	ohms	pin	dc volts	ohms	pin	dc volts	ohms	pin	dc volts	ohms
TESTING V1-6AU6				TESTING V5-6AK6				TESTING V7-6AU6			
1	—	0	2	130	0	inf.	0	1	—	0	47K
2	0	47K	4	30	inf.	1	0	2	0	2	47K
3	0	0	5	—	0	47K	3	0	3	0	5.6K
4	0	0	6	no connection	0	0	4	0	4	0	0
5	6	0.5	7	6	0.5	0	5	0	5	0	0.5
6	108	inf.	8	1	470	3	0	6	0	6	0.5
7	0	1				4	0	7	0	7	inf.
TESTING V2-6AK6				TESTING V4-12AU7				TESTING V9-6AK6			
1	0	100K	2	110	0	inf.	1	0	1	0	47K
2	0	0	3	0	0	to 1 meg.	2	0	2	0	47K
3	0	0	4	0	0	0	3	0	3	0	5.6K
4	6	0.5	5	0	0	0	4	0	4	0	0
5	108	inf.	6	2.5	2.7K	5	0	5	0	5	0.5
6	108	inf.	4	6	0.5	5	0	6	0	6	inf.
7	1.5	82	5	6	0.5	5	0	7	0	7	inf.
TESTING V3-6L7				TESTING V6-0B2				TESTING V8-6AK6			
1	0	0	6	80	inf.	6	0	1	0	1	150K
			7	0	470K	7	0	2	0	2	0.5
								3	0	3	0.5
								4	0	4	0.5

All voltage and resistance checks made with a 20,000 ohm/volt volt-ohmmeter or VTVM. Low resistance voltmmeters should not be used for these checks.



Small lamp was installed inside this model to adapt it for use as a night light in boy's bedroom.

ONE of the great American transportation classics, the covered Conestoga wagon makes an ideal model for beginning model-crafters. As shown, its details can be simplified without sacrificing an authentic appearance. And it is easily convertible into a night lamp for a youngster's room, as indicated in Fig. 1.

All balsa parts will cut out of a single 2 x 36-in. sheet of $\frac{1}{8}$ -in. balsa wood, available at hobby shops. Pine and maple scrap will do for the other wood pieces. Cut the parts as you go along to allow for any deviation in dimensions which may occur during assembly.

Constructing the Wagon Body. Start work by shaping up the wagon sides and bottom as in Fig. 3A and B. On the bottom piece, bevel front edge 45° from top as in Fig. 3B and bevel its side edges 10° . Then bevel top and bottom edges of side pieces 10° so they will fit flush as in Fig. 4. Assemble with cement and straight pins as shown in Fig. 4, keeping pins $\frac{1}{8}$ -in. from edge and about $\frac{1}{2}$ in. apart.

Cut seat, seat back, front and foot boards (Fig. 3C) slightly oversize and score V-grooves across front board to simulate individual boards. Install front board first, as in Figs. 5 and 6, using cement after sanding it flush at bottom and sides. Next shape seat to exact width, rounding off front edge and corners. Sand it to length, after checking it against assembly and cement as in Fig. 5, with seat $\frac{1}{16}$ -in. lower than top of wagon sides.

After checking assembly, shape up seat back for snug fit between sides and against seat. Shape foot board to fit flush against seat back and front board when located $\frac{1}{16}$ -in. below top edges of step-downs in the wagon sides as in Fig. 6.

Make the balsa wood tailgate as in Fig. 3D.



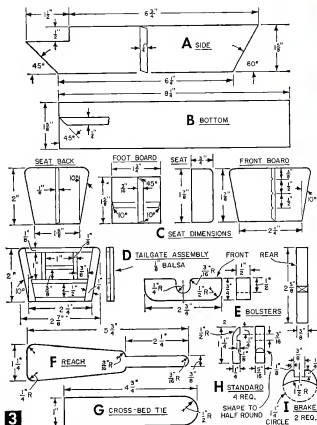
By R. J. DeCRISTOFORO



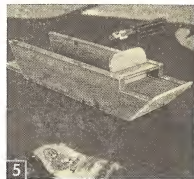
Other side of the covered wagon shown in an appropriate outdoor setting for pioneering days.

Cut a $\frac{1}{8}$ x $\frac{1}{4}$ -in. strip for side trim and $\frac{1}{8}$ x $\frac{1}{8}$ -in. strip for all other tailgate trim. Check gate against the wagon body to assure a good fit, then fasten trim with cement. When dry, sand trim edges lightly to give roughly a half-round shape. Cement assembled tailgate to body as in Fig. 7.

Out of the $\frac{1}{8}$ -in. balsa sheet, cut four $\frac{3}{16}$ x 8-in. strips for sheer bands and sand top



Straight pins make good "nails" for attaching wagon sides to bottom. Bore holes with a #60 drill first and hold work in a clamp.



In seat assembly, install front and seat first, then correct position for seat back and foot board will be automatic.

edges to near half-round shape. Determine center line on each wagon side. Push a straight pin through center of a band and on wagon centerline $\frac{3}{16}$ -in. below top. Bend up at each end as in Fig. 6 and drive in pins to hold the position. Do the same for top band on other side. Then attach lower bands in similar fashion, with their centers $\frac{1}{16}$ -in. below that of top bands. Move bands out a bit on the pins and squeeze cement in between them and wagon sides as in Fig. 7; then press down bands for firm contact. When dry, trim off ends.

Shape up the bolsters as in Fig. 3E, forming a center groove in front bolster with a coping saw. If you prefer to cut a dado on your table saw, use an oversize piece so you'll have something to handle. Cement front bolster on wagon bottom $\frac{3}{4}$ -in. behind front board and centered. Cut the reach as in Fig. 3F and use it to locate rear bolster. Center the rear bolster across wagon bottom and align it with wide end of the reach. Project front of reach about $\frac{1}{16}$ in. through front bolster dado as in Fig. 6C and cement in place. Shape up cross-bed tie as in Fig. 3G and cement in place between wagon bottom and reach, $1\frac{1}{4}$ in. behind front bolster so that tie projects equally on each side of the

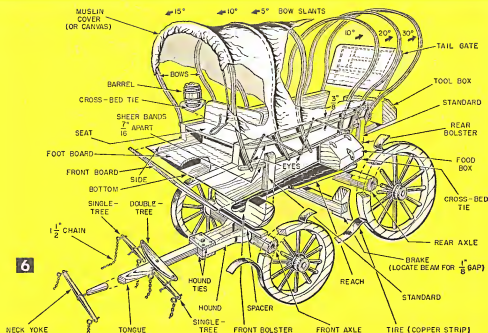
wagon.

Cut the four standards to outside dimensions as in Fig. 3H. Locate each in its position over a bolster, as in Figs. 1, 6 and 10, to mark cut-out for a sheer band. Cut this carefully with a coping saw and cement in position.

Cut a $\frac{1}{4} \times \frac{3}{8} \times 4\frac{1}{4}$ -in. piece of pine for a brake beam. Shape brake blocks from pine scrap as in detail I in Fig. 3 and cement each end of the beam into a groove of a brake, making ends flush as in Fig. 9. Put this sub-assembly aside until wheels are in place.

Cut the simulated food and tool boxes out of pine scrap to sizes in Fig. 8A and B. From thin copper sheet, shape six pieces as shown in Fig. 8C, and attach with $\frac{1}{4}$ -in. escutcheon pins to simulate hinges and hasps of the food and tool boxes, as in Figs. 1, 2, 3A and B. Center food box on one side of crossbed tie (Fig. 2) and tool box on tail end of wagon bottom (Fig. 1); then cement boxes in place.

You can turn the water barrel from a 1-in. dia. maple dowel to dimensions in Fig. 8D. Mount a 7 or 8-in. length of dowel in the lathe and turn barrel shape close to either stock as in Fig. 9, to avoid whip. When shaped and sanded, remove barrel, cut off waste ends and sand smooth. As an alter-



MATERIALS LIST—COVERED WAGON

No.	Size and Description
Req.	
1 pc	$\frac{1}{4}$ x 2 x 36" balsa (for seat and back, front board, tailgate and trim, sheer bands, bows, spacer, hound ties, barrel handle)
scrap	assorted small pine or similar pieces from shop scrap or a box such as an apple crate (for sides, bottom, foot board, bolsters, reach, cross-bed tie, brake assembly, food and tool boxes, axles, hound, tongue, standards, wheel rims, doubletree)
1	1" dia. x 36" maple dowel (barrel, 4 hubs)
1	$\frac{3}{4}$ " dia. x 36" dowel (yoke, 2 singletrees)
2	$\frac{1}{8}$ " dia. x 36" dowels (48 wheel spokes)
1 pc	.016 x $\frac{1}{2}$ x 12" copper (4 tires)
1 pc	.016 x $\frac{1}{2}$ x 12" copper (hinges, hasps for tool, food boxes)
12	#16 x $\frac{1}{4}$ " brass escutcheon pins (for hinges, hasps)
2	#16 x $\frac{1}{4}$ " brass escutcheon pins (for tongue)
5	#16 x $\frac{1}{4}$ " escutcheon pins (running gear, wheel) or 3d box nails
2 ft	.032" copper wire (for tongue assembly)
1 ft	small link chain (for tongue assembly)
Misc	$8\frac{3}{4}$ x 12" pc muslin or light canvas, 4 ft brown string or heavy thread, pkg straight pins, model cement or glue, contact cement

nate, you could do this in a drill press if you cut dowel to correct length and drilled a center hole so dowel could be mounted on a bolt and gripped in the chuck. Use files for shaping. Cut handle out of balsa as in Fig. 8D, and cement to barrel top.

Axle-Tongue Assembly. Shape rear axle (Fig. 11B), trimming each end to a near round shape, center axle over rear bolster and cement in place. Prepare the front axle housing (Fig. 11A), using a coping saw for the two dadoes. Nearly round ends as above.

To make the hound (Fig. 11C), drill the $\frac{3}{4}$ -in. hole first, cut slot to meet it and then shape the outside. Cut a $\frac{3}{8}$ x 2 $\frac{3}{8}$ -in. spacer out of $\frac{1}{8}$ -in. balsa, fit hound inside the hous-

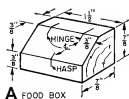


Sheer bands are bent without steaming or soaking. Pin in position, cement bands and then push them tight against side. Remove pins and excess cement when dry.

ing dadoes and cement spacer across the openings in housings.

Shape the tongue as in Fig. 11D, tapering one end down to a $\frac{1}{8}$ -in. dia., and the hound ties as in Fig. 11E. Place ties across ends of hound prongs as shown in Fig. 10, and attach with cement and $\frac{1}{4}$ -in. escutcheon pins. Sand top and bottom of tongue on its wide end so that it can swing a bit up and down when attached to the hound. Insert end $\frac{1}{4}$ in. inside the hound ties and fasten with $\frac{1}{2}$ -in. escutcheon pin after boring mating hole through center of hound ties and tongue.

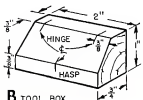
Shape the doubletree from pine as in Fig. 11F, hand sanding front and rear edges to nearly half-round. Shape the singletrees and neck yoke as in Fig. 11G by chucking $\frac{3}{16}$ -in.



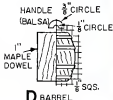
A FOOD BOX



C HINGES, HASPS (6 REQ)



B TOOL BOX



D BARREL

8 ACCESSORIES



Turning water barrel on 1-in. maple dowel. When finished, cut off excess stock, sand edges smooth and add a few scratches and nicks to emphasize a well-worn appearance.

dowel in a drill press or portable electric drill and tapering with file or sandpaper.

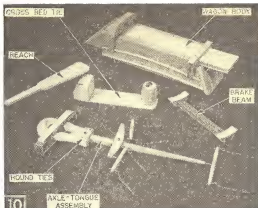
To attach chain, thread a 2-in. length of wire through end link of a 1 1/2-in. length of chain. Center chain on the wire and wrap wire around a small nail to form a ring. Twist wire tightly about six times, cut off excess wire beyond the twisted area, then cement the twisted free end in hole at end of yoke. Repeat for other end of yoke and each end of singletrees as in Fig. 10.

To fasten singletrees to doubletree, pass a 2-in. length of wire through hole in end of doubletree, center it and twist tightly about six times. Wrap around center of singletree, twist tightly twice and cut off excess.

Since the doubletree must swivel, drill a 1/16-in. hole through its center and attach it to the tongue with a 1/2-in. escutcheon pin.

Making the Wheels. Turn the four hubs from the remaining piece of your maple dowel mounted in the lathe, following dimensions in Fig. 12B. If you prefer, you can make the hubs one at a time on a drill press.

If you own a fly-cutter, you can make the wheel rims (Fig. 12A) easily as shown in Fig. 13. Clamp 3/8-in. pine stock firmly to drill



Sub-assemblies make the job easier. Water barrel and food box are on cross-bed tie to shoe position. Tie must be attached before these are added.

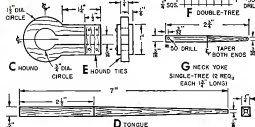


A FRONT AXLE HOUSING



B REAR AXLE

11 AXLE-TONGUE ASSEMBLY



C HOUND



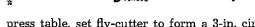
E HOUND TIES



F DOUBLE-TREE



G NECK YOKE



D TONGUE

press table, set fly-cutter to form a 3-in. circle for a rear wheel and drill down at slowest speed until you are almost through the stock. *Don't cut all the way through*, or the ring will surely break. Do the same with the inner circle. To free the ring, cut carefully through remaining stock with a sharp knife. Sand smooth. Repeat the process for the 2-in. diameter front wheels.

You could also turn out the rims on a lathe or, with a little more effort, form them with a coping saw or on a jigsaw.

Using 1/8-in. dia. dowel, cut 24 spokes 1 1/4 in. long for rear wheels and 24 more 3/4 in. long for front wheels. Now make a cardboard template the size of the wheel, mark diameters 30° apart and place wheel rim on it to mark proper spoke spacing, bore holes through rim at each mark, first with a #50 drill, then open up to 1/8-in. dia. Insert spokes through rim to hub as in Figs. 12A and B, dressing hub ends as required so all will fit snugly in groove in the hub.

For tires, wrap $\frac{3}{8}$ -in. thin copper strip around each rim as in Fig. 14; butt the ends and attach with contact cement. Drill $\frac{1}{16}$ -in. holes through center of wheel hubs and into ends of each axle for depth of $\frac{5}{8}$ in.

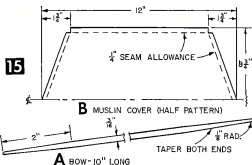
To attach front running gear, drill a $\frac{1}{16}$ -in. hole through center of front axle housing and spacer, drill the same size hole up through center of bolster and fasten by driving in a #16 x $1\frac{1}{4}$ -in. escutcheon pin or a 3d box nail. Use same type pin or nail to attach wheels to axles. Open up wheel holes just enough to permit free wheel movement. Locate the brake beam assembly, made earlier, so that curved edges of brake blocks are $\frac{1}{8}$ in. in front of rear wheels as in Fig. 1, then cement beam to the reach as in Fig. 6C.

For bows, cut six or more strips out of $\frac{1}{8}$ -in. balsa sheet, then slightly taper ends and round edges as in Fig. 15A. Extras will come in handy in case of breakage while handling. Soak strips in hot water for several hours before bending. If they don't bend easily, soak longer. Bend and locate as in Fig. 6D. Hold in place with straight pins and cement. Drive pins through and snip off excess inside of the wagon.

Cut cover from an old bedsheet or piece of light canvas to dimensions in Fig. 15B, fold over edges $\frac{1}{4}$ in. where indicated and sew seams. Thread string through seams in each end. Soak the cover and, while wet, shape it over the bows. Pull string tight at each end and knot the rear one. Leave the front one loose so cover can be pulled back near the seat.



14 Coat both rim and tire with contact cement. When dry, roll tire onto wheel, but be sure position is correct.



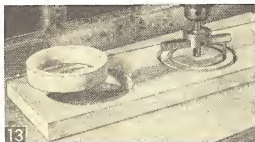
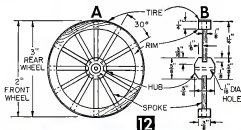
Make the eyes from straight pins snipped to $\frac{5}{8}$ -in. length. Form a small ring at the blunt end with long nose pliers and press eyes in place at locations shown in Fig. 6. Knot string at the rear eye on each side, thread it through a needle, then pass it through seam on the cover, through the next eye and so on as in Fig. 1. Pull tight and knot at last eye.

That Weatherbeaten Look. To be really authentic, your model should appear rough and weatherbeaten. Use medium sandpaper to mar any square corners. Nick and scuff edges of tool box, food box, barrel and standards.

Go over all wood parts with light maple stain and, before dry, add walnut stain in places such as wheel hubs and rims, corners and foot board. Let it soak in on end grain and rub it off on some flat surfaces to create highlights.

Avoid blotching and feather in the walnut stain to the basic maple coloring as much as possible. No further finishing is necessary, but you could apply a very light coat of orange shellac to help preserve the appearance, and rub lightly with steel wool to dull the gloss.

DON'T MISS AN ISSUE—The next issue of **SCIENCE** and **MECHANICS** will be on the newsstands only 30 days. It goes on sale August 30th. Better buy your copy as soon as you see it—the way they've been selling lately, we don't have back copies available in case you miss one.



13 You get matching rims for two wheels if you cut rings from $\frac{3}{4}$ -in. stack. Use fly-cutter at slowest speed, cut nearly through and finish with sharp knife. Clamp ring and slice in half with fine hacksaw blade, turning ring several times during the process.



1 View of 12-ft. section of low bulkhead before installation of cap rail. Iron rods protruding through posts are attached to bulky "anchors" buried in back. Nuts added to threaded rod ends are tightened to straighten bulkhead line; can be adjusted easily to meet changing conditions.

Bulkhead Land Saver for Waterfront Homes

By CLINTON R. HULL

IF you own a waterfront home, a low bulkhead to resist the erosive action of tides, currents or waves is one of the best investments you can make. Using treated, rot-resisting wood as in Fig. 1, you can do a very creditable job at a fraction of the cost of a concrete-steel project.

Before locating the bulkhead, consider the difference between normal high and low tides or, in the case of lakes and streams, high and low water. Most practical site will be at the point where high water stands about 12 to 18 in. deep. This places the bulkhead far

enough back to provide some beach in front of it during low water, to permit a more level fill behind it for the cottage yard and to make a high, more expensive and much harder-to-hold bulkhead unnecessary. Set back from the channel edge, moreover, your bulkhead will not be undermined nearly as quickly.

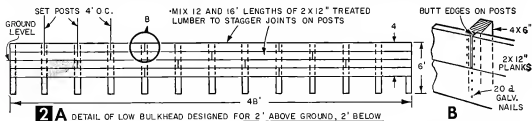
The anchored bulkhead shown in Fig. 1 is formed of 2 x 12-in. planking on 4 x 6-in. posts 6 ft. long, installed with only the two top rows above ground. We used redwood straight-grain stock, but cypress or cedar will do as well.

Multiply the length of your bulkhead by four for linear feet of planking required and specify it in 12 and 16-ft. lengths in order to stagger the joints on the posts as in Fig. 2A. Divide bulkhead length by four and add one to get the number of posts you need. Order both unsurfaced to provide full thickness and a better

surface for preservatives. Cut planks and posts to size and shape post bottoms to a point with a hatchet or axe.

Treat the Wood Yourself. Pressure-treated lumber is ideal, but you can save considerable money if you have the patience to do a preservative job yourself. Mix equal parts of liquid tar, creosote and kerosene. Lay out the wood in the hot sun and give it a soaking coat daily for a week. Don't forget the ends.

If you are on tidal water, plan ahead by checking tide tables for the days when low tide will occur at your most convenient work-



2A DETAIL OF LOW BULKHEAD DESIGNED FOR 2' ABOVE GROUND, 2' BELOW



3 Pipe jet formed by connecting length of $\frac{1}{2}$ -in. pipe to hose of larger inside diameter helps speed the digging for posts through tough beach sand.

ing time. If along a stream or lake, do the job at a time of low water.

Begin construction by sinking the two end posts 4 ft. into the ground, using an auger, post-hole digger or shovel where possible. If the ground is not too hard, you may be able to drive the pointed posts into position with a heavy maul. Neither method will apply if you are working in beach sand. In that case, you will need to rock the posts "home" aided by water pressure.

Put a hose connection on an end of $\frac{1}{2}$ -in. pipe about 8 ft. long and bend that end of the pipe to about a right angle. Couple this to a garden hose, turn on water, and use the pipe as a jet nozzle as in Fig. 3. If water supply or pressure is lacking, you can rent a small motorized pumper from a local hardware store, well driller or boat landing operator. Insert the pipe jet into ground at a post location; work it back and forth for speedier action, then rock post in position with aid of the jet as in Fig. 4 until seated firmly at level you desire. You'll need approximately 15 minutes to position each post.

Install the other end post and stretch a tight line between them to check for alignment, height and spacing of other posts. If line sags because of distance, install a center post next to tighten and straighten line for full length. Mark line every 4 feet to indicate post centers. Install remaining posts and level tops.

To make room for planks, dig a 2-ft. deep ditch on a line in back of and across all posts. If you are dealing with dry sand or mud, this can be the toughest part of the job. Thoroughly soak all dry sand in the path



4 Work post down to proper depth by twisting and rocking back and forth while pipe jet alongside supplies water under pressure to loosen sand below.

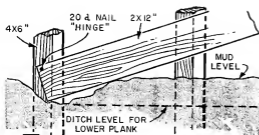
of the planks with a lawn sprinkler to keep it from filling the ditch as fast as you dig it out. Use some planks to help hold it back.

Where mud is encountered, dig it out at a post where you plan to install one end of a bottom plank. Work end to approximate position, put a 20d galvanized nail through upper corner of the plank and part way into the post to act as a hinge as in Fig. 5. The plank will gradually sink as you dig mud out from under it. If an assistant is handy to stand on the plank, it will level out more quickly.

After checking position with tape and level, nail up each bottom plank, using 20d galvanized spikes. Drive these in firmly, four at each post, including joint ends as in Fig. 2B to reduce gradual tendency of planks to warp outward under pressure of the fill and pull of the sun on the exposed side. Spike other rows of planks in position, butting joints on different posts. Top plank should be flush with post tops; if not, saw off any excess on posts.

Holding the Bulkhead in Line. Discarded flywheels, old metal car wheels and similar bulky objects make excellent anchors for the bulkhead. Obtain one for every other post in the bulkhead, as well as a $\frac{1}{2}$ -in. dia. x 8 ft. iron rod with a head at one end and threaded for a nut at the other end—or threaded each end. Attach rod firmly to an anchor and extend threaded rod end just past an end post.

Bore a $\frac{1}{2}$ -in. dia. hole through center of top plank and post at a slight upward angle as in Fig. 6. Pass threaded rod end through hole, slip on a washer and engage nut. Dig out enough sand or dirt to bury anchor 30 in. and to lower rod as needed, then



5 SETTING BOTTOM PLANK IN MUD

refill area and pack down. Do the same to every other post in the bulkhead. Draw up on the nuts as desired to straighten bulkhead where needed.

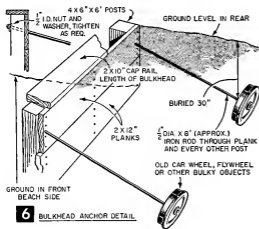
Cut off rod protruding beyond nuts, smooth rough edges with a file and touch up threaded areas, nut, and washers with the creosote mixture or paint to prevent rusting.

Level ground on each side of the bulkhead as desired. An anchor may shift a bit in the process; also during the first few days as the earth settles. Adjust by tightening nuts on threaded rods where needed.

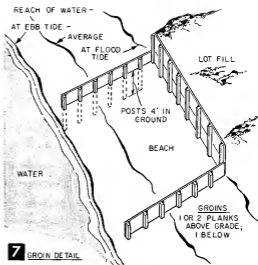
Build steps cut from 2 x 12-in. planking and 4 x 6 post as in Fig. 1. For wider, stronger steps, nail stringers against inside of two bulkhead posts. Apply several coats of the preservative to all exposed wood.

Built-in Seat for Bathers. To improve strength, appearance and utility, install a 2 x 10-in. cap rail across top of the bulkhead as in Fig. 6, except the part where steps are located. Order the wood smooth four sides and spike it well to the edge of the planking, after centering all butt joints over posts. Use 20d galvanized nails spaced a foot apart. Also drive two nails into ends of each post. Round off all outside edges and sand smooth.

The rail need not be treated with the creosote preservative, but should be well protected. As a more attractive finish for bath-



6 BULKHEAD ANCHOR DETAIL



7 GROIN DETAIL

ers, you can use marine primer and deck paint, or cover rail with stain and several coats of marine spar varnish.

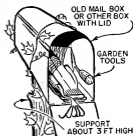
Taming Swift Currents. If swift-running current or strong tides wear away your beachfront despite a bulkhead, you can break up or redirect the flow by installing a two or three-plank groin on each end of the bulkhead at right angles to the beach as in Fig. 7.

Construct groins in the same manner as the bulkhead, with posts backing up planking against direction of strongest currents. If incoming and outgoing tides exert equal pressure against the property, alternate posts on each side of the planking and space them only 3 feet apart.

When your work is done, go over all exposed areas with a new application of preservative. Do this periodically and your bulkhead will last many years.

Garden Tool Box

• Keep your work-gloves and small garden tools such as trowel and shears—near flower and vegetable beds for quick access when you have a few minutes to spare. On a post made of scrap lumber, angle iron or thick tree limb, about 3 ft. high, nail or bolt an old lunchbox, RFD mailbox, small wooden box, or even an old, untenanted bird-house with top or one side hinged and bird-entrance plugged up. Paint unit according to your taste and, if desired, train climbing vines or flowers up base and around box.



MADE ONLY BY *Crafts-Pac*

THE ORIGINAL PACKAGED BOAT KITS



- World's Largest Line—New Fiberglass Hulls. Over 200 styles. Boats—Kits, Formed—Hulls, Semi & Custom finished. All types: Prams, Cruisers, Racers, Inboards, Outboards. Easy to build. Professional results. Dealers—Agents Inquire.
- Send 15c for 3-Color Catalogs 52 pg. Kit Catalog plus 20 pg. Hardware and 8 pg. Armor Glass books. (SPECIAL OFFER!) All 9-colored CATALOGS plus "Boating Handbook"...all for \$1.

CUSTOM • CRAFT

★ **BOAT PLANS, PATTERNS, FRAME PACS**

- Over 400 Plans—Patterns, Frame Pak Kits, Prams, Kayaks, Racers, Runabouts, Catamarans, Cruisers, In-Outboards (6' to 40') Wood, Plywood and Steel. Send 35¢ for 120 pg. Plan Catalog. Catalog plus "Boat Building Handbook"... Send \$1.00.

Buffalo 7P, N. Y.

RUPTURE D?

NEW LASTING RELIEF



ENTIRELY DIFFERENT

ENJOY NEW FREEDOM...

of action, amazing peace of mind and comfort at work or play. New pleasures replace rupture pain. The proven, patented MILLER holds your rupture back Day and Night... bringing you new lasting relief as it has thousands of others.

Get FREE facts in plain wrapper. Send Name & Address to:

FRED B. MILLER DEPT 4-M
Exclusive Manufacturer HAGERSTOWN, MARYLAND

BUILD

and Save with this Home Plan Library



Over 700 plans custom designed to fulfill owner's cherished dreams, cost-saving, lasting construction, and to suit any site. You can save \$1000 or more whether you do the building or contract it. Complete working blueprint sets, materials lists, etc., at low-low cost.

- ☐ FAMILY ROOM HOMES 222 easy-living plans
- ☐ HILLSIDE & SPLIT-LEVEL 100 advantageous designs
- ☐ NEW TRENDS In Selected Homes... 260 special plans
- ☐ Block Masonry Homes 223 economical beauties
- ☐ WEEKEND PLANS Easy-to-build cabins, lodges
- ☐ DUPLEX HOMES 40 money-making plans

SEND TODAY! Postpaid in U.S. and Canada

HOME BUILDING PLAN SERVICE

Studio X 2454 N.E. Sandy Blvd., Portland 12, Oregon

20" ATTIC FAN KIT



Easy to assemble. Belt-driven. Blade, shaft, 2 self-aligning bearings, 2 pulleys, 2 collars, and V-belt. Everything you need, except frame and 1/4-hp motor, to make your own house cooler. Postpaid—USA only. Send for free 100-page catalog. **SAVE \$46.00**

PENNA. WHOLESALE DISTRIBUTORS
104 N. 6th St., Phila. 6, Pa.

ONLY **\$6.95**

now on sale at your local newsstand!

1960 EDITION

- ★ 24 different Bill Jackson boats
- ★ All types—sports and racing runabouts, cabin cruisers, sailers and service boats, special-purpose craft
- ★ Step-by-step instructions, show-how plans, complete materials lists
- ★ Boats designed to fit all budgets, adapted to all levels of craftsmanship and nautical skill
- ★ Plus special bonus insert: detailed blueprint plans for 14-ft. planing runabout

thumb through a copy at your newsstand or send 75c for Handbook No. 567 to:

SCIENCE AND MECHANICS

Dept. 347

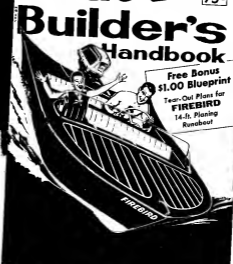
450 East Ohio Street, Chicago 11, Illinois

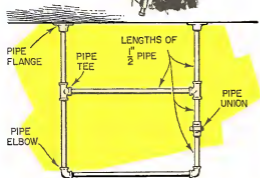
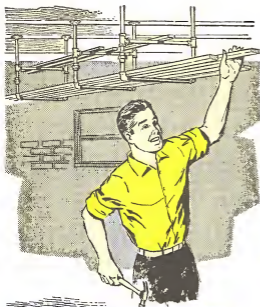
24 Boat Plans by Bill Jackson

Boat Builder's Handbook

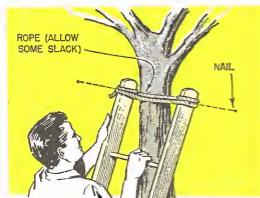
SCIENCE and MECHANICS 75c

Free Bonus \$1.00 Blueprint Tear-Out Plans for FIREBIRD 14-Ft. Planing Runabout





Store long material on a rack made from lengths of water pipe and fittings. Mount to overhead joists with lag screws or large wood screws. Center frame keeps flexible material from sagging or supports shorter material.

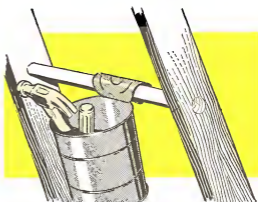


Tie a stout rope around the ladder near the end and you'll have an easier time climbing the heights of a tree or pole. If the ladder is frequently used for this work, nail the rope to the ladder sides.

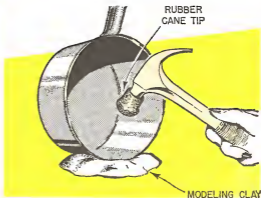
Ideas For



Replacement pencil erasers slipped on clothes hooks will keep garments from falling off.

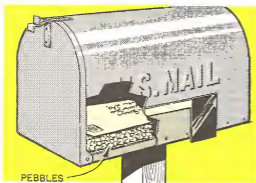


A large juice can with the lid partly cut out, trimmed and bent as shown makes a handy portable container for tools and small parts needed for ladder jobs.



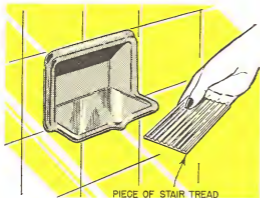
A dented aluminum pan or kettle can, in many instances, be restored to shape with a hammer fitted with a rubber cane or crutch tip. Use modeling clay as an anvil on which to rest the pan.

Your Home



PEBBLES

A layer of pebbles covering the bottom of a leaky mail box will keep the letters above the water line.

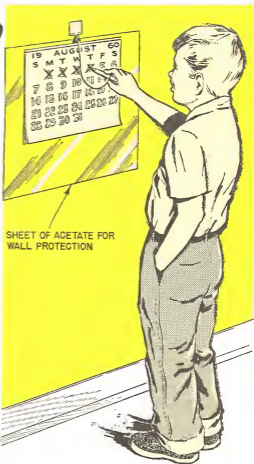


PIECE OF STAIR TREAD

A piece of corrugated rubber stair tread placed inside the built-in bathroom soap holder eases cleaning. Just rinse under the water tap.



Make spading easier by bolting a short piece of angle iron to the edge of the spade. Or, split one or two pieces of old lawn hose lengthwise and fit them to the spade.



SHEET OF ACETATE FOR WALL PROTECTION

Teach a small child to cross off each day on a calendar hung on the wall of his room and he'll acquire number recognition and automatically learn the use of the calendar. Suspend the crayon or pencil from the wall on a string.



Freshen your soiled dust mop by boiling it in water to which you've added a tablespoon of soda and two of paraffin. To the rinse water add ten drops of furniture polish.

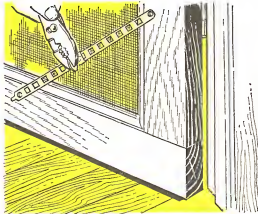
More Ideas For



Use solder wire as a linoleum-cutting guide. Start with a right angle, then bend wire to outline obstacles such as oddly-shaped corners and built-ins. Place wire pattern on linoleum, trace, then cut out.



When a closet is not provided with an electric light, hang a child's toy or sportsman's electric lantern on a coat hook. It's easily turned on and off and the infrequently used batteries last quite a while.



Re-align a sagging screen door by screwing across the corner a straightened hose clamp and turning the thumb screw as needed.



Use a paint roller, immersed in warm sudsy water, to soak wallpaper for removal. Pull off with the aid of a painter's broad knife.



Use a baby bottle brush to clean out those narrow-necked flower vases.

Your Home



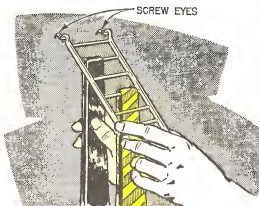
Make a luxurious bathmat of 1" foam rubber. Add a black border and initials with plastic rubber, applying it directly from the tube after having sketched the initials with a soft-lead pencil.



If your rubber-covered dish drainer ages and sticks, clean and dry it, then apply a thin coat of white shellac to harden the rubber and keep it from sticking.



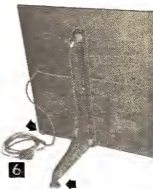
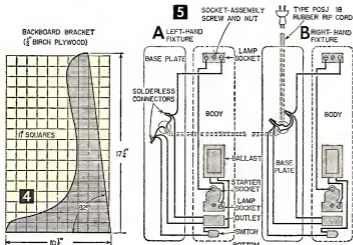
Warm air from a hair drier, directed from the side against charcoal briquettes will hasten igniting. The same idea works well with fireplaces, furnaces and small shop forges.



A bird ladder can serve as a handy tie rack. Fasten in place with screw eyes.



Use Dad's arbutal portable electric sander, equipped with a lambswool pad, as a massager. It will stimulate circulation and relax aching muscles.



Suction cup keeps portable shaving mirror from tipping or sliding; rubber knobs prevent scratching.

MATERIALS LIST—PORTABLE SHAVING MIRROR	
No.	Req.
2	2 1/2 x 16 3/4" chrome-plated 14-watt fluorescent fixtures with warm-tone lamps (#F20T12-WWX), switches, convenience outlets (Progress "Fleur-O-Ray" #101500 or equivalent) (\$13 per pair postpaid from City Electrical Supply Co., 10 Union St., Malden 48, Mass., on receipt of money order)
10 ft	#18 type POSJ rubber rip cord (line cord)
1 pc	1/2" x 2 x 3' birch plywood (backboard, bracket, support) (Try building specialty store or local cabinetmaker)
1 pc	1/8 x 12 x 15" mirror (local glass shop)
4	plastic mirror clamps
1	1 1/2"-dia. rubber suction cup with #6-32 threaded stud (auto supply store)
1 pr	tight-pin 1" cabinet butt hinges (bracket)
Misc	4 solderless connectors for #18 wire, attachment plug, 2 rubber knobs and the following zinc-plated #4 wood screws: 3 #7 x 7/8" (support), 4 #6 x 5/8" (mirror clamps) 8 #4 x 1/2" (hinges)

WWX, stocked by many hardware and electrical stores. They are pre-wired but lamp sockets must be assembled. Similar makes can be used but you may need to vary dimensions. If you can't obtain them, write Progress Mfg. Co. Inc., Castor Ave. and Tulip St., Philadelphia, Pa., for name of nearest dealer. (See Materials List.)

Birch plywood is ideal for the wood backboard and support because its smooth, close grain takes stain and finish well. A 2 x 3-ft. piece is ample for your cutouts, with enough left over for the make-up mirror.

Cut the backboard (Fig. 3A), the bracket (Figs. 3B and 4) and bracket support (Fig. 3A, B) to sizes given. Sand all surfaces with 3-0 and 6-0 garnet papers, rounding all edges slightly. Remove base plates from fixtures to use as templates in position on backboard. Mark and bore small lead holes for screws 3/8-in. deep. Locate and bore through panel the 5/16-in. line cord holes. Bore and countersink body holes for screws on the bracket support.

Next apply your choice of finish to the three wood parts. We used a walnut stain, spreading it on quickly and evenly. If plywood edges have an open grain or defects,

add wood filler and sand smooth before staining.

After setting about 10 minutes, wipe off excess stain, blend with a clean cloth and let dry thoroughly. Sand *lightly* with 6-0 paper and wipe clean. Then apply a thin coat of 5-lb. cut, white shellac thinned 50/50 with alcohol, let dry and sand lightly with the fine paper. Follow with one or two coats of dull furniture varnish.

Attach fixture base plates to the backboard as in Fig. 3A and C. Run line cord from back of panel through one of the base plates and attach to leads of a fixture with solderless connectors as shown in Figs. 3D and 5A.

Mount fixture on baseboard with screws furnished. Run line cord straight across rear of baseboard through hole in the other base plate as in Fig. 3A and cut it, leaving enough length for connection to the other fixture. Then pass remaining long length of line cord through this hole from the rear. Join leads of the two line cords and the fixture with larger size solderless connectors as in Fig. 5B. Mount fixture.

Attach plug to free end of line cord, insert



When installing mirror, make sure backboard is perfectly flat and clean. File down clamps to fit and screw down only enough to hold glass firmly. Too much pressure will crack the glass.

fluorescent tubes and test for performance. Fixtures should be wired so that convenience outlets are "live" at all times, with switches controlling the lights only.

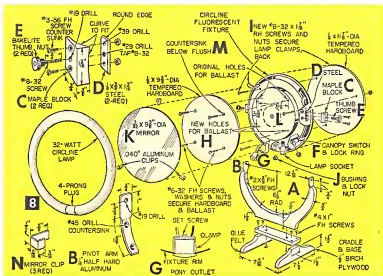
Thread and shellac stud of suction cup to end of plywood bracket and fasten bracket to support strip as shown in Fig. 3B. Tack or screw in rubber knobs on bottom of baseboard and screw assembled bracket-strip to back of baseboard as in Figs. 3B and 6.

Have the mirror cut and smoothed to size at your local glass store and attach with plastic clamps as in Figs. 3C and 7.

Your shaving mirror is ready for use when you wet the suction cup and press it firmly on the surface. For more permanent adhesion, use glycerine.

Portable Make-Up Mirror. This much smaller unit should have special appeal to the ladies. It can be tilted at any angle on the dressing table (Fig. 2) or, with base removed, hung on a wall.

It uses a ceiling-type, fluorescent fixture equipped with 32-watt Circline warm-tone lamp (#FC12T10-WWX) and G. E. rapid-start ballast, thus requiring no starter. Our choice was an Arrow "Circlite" #CS32-RS with 12-in. diameter and an edge shaped to allow use of needed block pieces for side



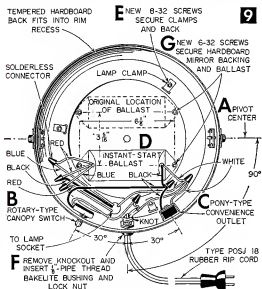
pivots. Try hardware or electrical shops for this type, but if difficult to obtain, City Electrical Supply Co., 10 Union St., Malden 48, Mass., will send you fixture and lamp post-paid on receipt of a \$9.50 money order.

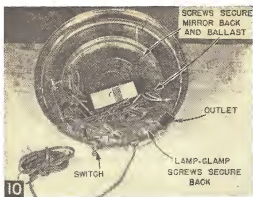
Cut out cradle and base parts from 1/2-in. birch plywood with a jig saw to dimensions as in Fig. 8A or modified to accommodate the fixture purchased. Sand each component in the same manner as described for the shaving mirror stand, assemble as in Fig. 8A and finish according to previous directions. Glue felt strip along bottom of base.

Make two pivot arms from half-hard aluminum as in Fig. 8B and recess flush into inside top edges of cradle. Bore very small

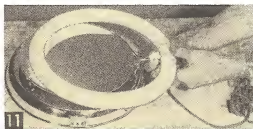
MATERIALS LIST—PORTABLE MAKE-UP MIRROR

No. Res.	Size and Description
1	12" dia. chrome-plated fluorescent ceiling fixture with instant-start ballast and Circline 32-watt lamp (fast-tone lamp #FC12T10-WWX (Arrow "Circlite" #CS32-RS or equivalent))
1	pony-type convenience outlet (such as Leviton #306)
1	rotary canopy switch with nickel knob (Leviton #S77)
1	1/4" pipe thread Bakelite cord bushing and lock nut
7 ft	#18 type POSJ rubber rip cord (line cord)
1 pc	1/2 x 8 x 14" birch plywood (cradle and base)
1 pc	1/8 x 1 x 2" tempered hardboard (fixture and mirror backs)
1 pc	1/2 x 9 3/4" dia. mirror
2 pcs	1/4 x 3/8 x 2 3/8" half-hard aluminum (pivot arms)
1 pc	.040 x 2 1/2 x 3" half-hard aluminum (mirror clips, wall hanger)
2 pcs	1/8 x 3/8 x 1 1/4" steel or brass (pivot support lock)
Misc	6 solderless connectors, attachment plug, maple scrap (for two 3/8 x 3/4 x 1 1/4" pivot blocks), 2 Bakelite thumb nuts from discarded "B" battery, 1/2 x 15" felt strip, 2 #8-32 x 1 1/4" rh zinc-plated machine screws and nuts, for lamp clamps, 2 #8-32 x 1" rh or fh machine screws for thumb-screw pivots, 4 #3-56 x 3/4" fh machine screws and nuts for pivot-block assembly, 4 #6-32 x 3/8" fh machine screws and nuts for mirror back-ballast assembly, 2 #6-32 x 3/8" rh zinc-plated machine screws and nuts for wall hanger, 6 #4 x 1" fh zinc-coated wood screws for base assembly, 4 #2 x 3/4" fh zinc-coated wood screws for pivot-arms assembly, Pliabond cement, glue





Inside of circular fixture with switch and outlet added and ballast moved below center of balance.



To install the Circline, press wired plug of fixture onto lamp prongs; then gently force lamp over spring clamps.

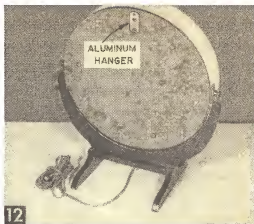
lead holes into the plywood edge for accuracy of placement and to prevent splitting, then fasten pivot arms with screwheads flush.

Shape two small blocks from maple scrap as in Fig. 8C curved to fit fixture. Drill center hole and flanking, countersunk screw holes through each block as in Fig. 8C. Holding fixture with its knockout hole at bottom, place the blocks half way up each side to locate and drill center pivot and screw holes through the metal case. Remove blocks and coat with aluminum paint.

Shape two lock plates of 1/8-in. steel or brass as in Fig. 8D. Drill each for block-attaching screws and center pivot, cutting the latter with a No. 8-32 tap. When blocks are dry, fasten to frame as in Fig. 8E and 9A with screws passing through block, frame and lock plate, then tightened with nuts.

On one side of frame about 3 in. or 30° from knockout hole, locate canopy switch (Figs. 8F and 9B), drill a 3/16-in. hole to receive its shank and install with lock nut. On opposite side the same distance from knockout, locate a pony outlet (Figs. 8G and 9C). Carefully scribe outline of its body, drill holes in each corner plus a few within the area and remove metal with a pair of diagonal-cutting pliers. Finish cut carefully with a small file to receive outlet snugly and attach with clamp furnished.

For better weight distribution in fixture,



Back view shows aluminum wall hanger.

relocate ballast at bottom as in Figs. 8H and 9D. Use it as a template to drill holes.

Remove screws securing 3 lamp scrap (Figs. 8I and 9E). Cut a circular piece of tempered hardboard for a back to fit rim recess, mark clamp screw holes and bore. Replace lamp clamps with longer screws as in Figs. 8I and 10. Screw nuts up tight to hold clamps, leaving long bolts extended.

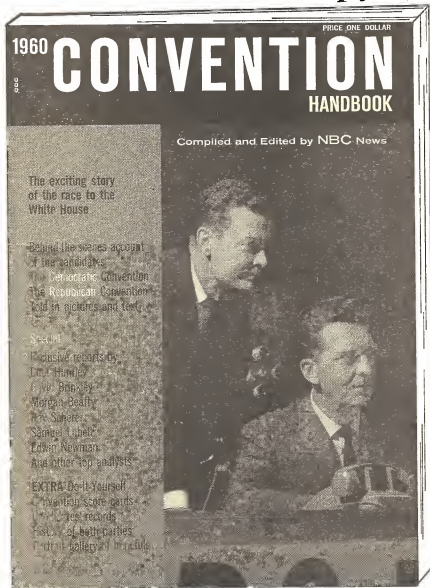
Before wiring, remove knockout in fixture, insert Bakelite bushing and secure it with a lock nut as shown in Figs. 8J, 9F and 10. Thread line cord through bushing and knot it to hold in place. Join cord to fixture leads with solderless connectors as shown in Fig. 9, wiring convenience outlet through the switch so that it is inoperative until lamp is turned on. Attach hardboard back to lamp clamp bolts with nuts.

From your local glass shop, procure the circular mirror as in Fig. 8K or modified to fit your fixture. Cut tempered hardboard to same diameter, center on face of fixture and mark for old and new ballast screw holes. If fixture has a raised center section in an otherwise flat surface, as indicated by dotted line in Fig. 8L, cut it out with tin snips and smooth any rough edges. Bore holes and secure hardboard as in Figs. 8M and 9G. Also secure the ballast with the two bottom screws and nuts.

Make three mirror clips from aluminum as in Fig. 8N to secure mirror to hardboard base. Apply cement such as Pliobond to the clips.

Make the two thumb screw pivots (Fig. 8E) by combining Bakelite thumb nuts from an old "B" battery with #8-32 screws. Squeeze end of screw thread lightly in vise so nut will thread on hard after applying cement. Cut off screw heads to length and attach fixture to cradle base. Attach Circline lamp to fixture as in Fig. 11.

*For Informed Viewing
Get Your Copy of:*



ON SALE June 23, or
at all newsstands
send \$1.00 to 1960 Convention Handbook,
Davis Publications, Inc., 527 Madison Avenue,
New York 22, New York, and we will rush your
copy to you by mail.

Dealers—Agents Make Big Profits \$67⁵⁰ \$125 PAINT SPRAYER only

This dual purpose paint sprayer—complete with heavy duty 1/3 H. P. 110V 60 cy AC motor on wheels is a 90 day offer. It has a low 40 lbs. pressure for paint spray gun and a high 90 lbs. pressure for tires, lubrication, etc. Finest 1 cyl piston comp 2.8 cfm, mounted on 10 inch wheels, large air tank, dual pressure safety valve, air gauge, cord and plug, V belt drive, Qt. spray gun. Dimensions 30"—18"—14". Shipping weight 80 lbs. F.O.B. Chicago.



order from

C. MARSHALL

3546 W. Fullerton

Chicago, Ill.

TELEPHONE HANDSETS



Use as inter-house phone, talk house to garage, as loud speaker system, etc. You receive transmitter, receiver, 3 conductor cord and simplified, illustrated installation diagrams. Handsets are guaranteed to be the same as used in our great National Telephone System. Price delivered \$2.95. Two for \$5.00!

TELEPHONE REPAIR AND SUPPLY CO.

Dept. H-1101

1760 Lunt Ave., Chicago 26

250 POWER....



Complete Telescope Lens Kit only \$3.49 postpaid
Conquer Space. Explore the Universe. Planets. Moon Craters. New Stars, etc. Complete Lens Kit consists of 80 inch focal length ground and polished objective lens, eyepiece lenses for 50 POWER, 100 POWER, 150 POWER, 200 POWER, 250 POWER, and all necessary lens fittings. Easy to make from simple step-by-step instructions. (Tripod and mount not included.) Money-back guarantee.
BUSSE SALES CO. DEPT. SM-43 HARTFORD 1, CONN.

"PSYCHIC DOMINANCE

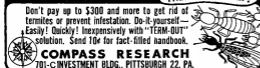
How to RULE OTHERS with your THOUGHTS." Full course—with stirring exercises. Illus. (Adults). \$3. Satisfaction or refund.

CLARION, Box 9309-V, Chicago 90.

TERMITES?

GET RID OF THEM YOURSELF!

Don't pay up to \$300 and more to get rid of termites or prevent infestation. Do-it-yourself—Easily! Quickly! Inexpensively with "TERM-OUT" solution. Send 10¢ for fact-filled handbook.



COMPASS RESEARCH

701-C INVESTMENT BLDG., PITTSBURGH 22, PA.

Broken or Loose FALSE PLATE?

Fix it Yourself EASILY in a Few Minutes
Your plates may become broken or loose just when you need them most. With FIX-IT-KIT you can repair your own broken plates. Also tightens loose fitting plates, easily. Get permanent comfort with professional material. Complete instructions. Satisfaction guaranteed or your money refunded. Order Now at a Plates Like New low price only \$2.98 postpaid—or sent C.O.D.
DENT-FIX DENTAL PRODUCTS, Dept. SM-131, P.O. Box 674, Kansas City 41, Missouri



STOP TOBACCO



Banish the craving for tobacco as thousands have with Tobacco Redeemer. Write Today for free booklet telling of injurious effect of tobacco and of a treatment which has relieved over 300,000 people.
In Business Since 1909

THE NEWELL COMPANY

Dept. 125,

Chesterfield, Mo.



MEN PAST 40

Afflicted With Bladder Trouble, Pains in Back, Hips, Legs, Nervousness, Tiredness.

If you are a victim of these symptoms, your trouble may be due to Glandular Inflammation. A constitutional Disease that requires special types of medical treatment. Neglect of such Inflammation causes men to grow old prematurely and before their time.

Most men, if treatment is taken in time, can be successfully NON-SURGICALLY treated for Glandular Inflammation. If the condition is aggravated by lack of treatment, surgery may be the only chance.

NON-SURGICAL TREATMENTS

The NON-SURGICAL New Type treatments used at the Excelsior Medical Clinic are the result of discoveries in recent years of new techniques and drugs, plus over 20 years research by scientific technologists and doctors.

Men from all walks of life and from over 1,000 communities have been successfully treated here at Excelsior Springs. They found soothing and comforting relief and new health in life.

EXAMINATION AT LOW COST

When you arrive, our Doctors, who are experienced specialists, make a complete examination. You then decide if you will take the treatments needed, which are so mild, hospitalization is not needed—a considerable saving in expense.

RECTAL-COLON

Are often associated with Glandular Inflammation. These disorders, we can successfully treat for you, at the same time we treat Glandular Inflammation.

REDUCIBLE HERNIA

Is also amenable to a painless Non-Surgical treatment that we have developed. Full details of this treatment given in our Free Book.

Write For FREE BOOK

The Excelsior Medical Clinic has published a New FREE Book that deals with diseases peculiar to men. It could prove of utmost importance to your future life. Write today. No obligation.



EXCELSIOR MEDICAL CLINIC

Dept. B6650

Excelsior Springs, Mo.

Gentlemen: Kindly send me at once, your New FREE Book. I am interested in full information. (Please Check Box)

☐ Glandular Inflammation

☐ Hernia
☐ Rectal-Colon

Name.....

Address.....

City..... State.....

Our 25 Most Popular

It's easy to build a boat from an S&M boat-plan Craftprint—as witness over a quarter-million mariners who have. Here are the 25 most popular boat plans we have ever published. In the design of each, economy, safety, ease of construction and superior performance were the chief considerations. Each Craftprint

comes complete with fully detailed, enlarged-size drawings, a complete materials list and step-by-step building instructions. No special tools are needed to build a professional-looking boat from our plans, no special skills. For the boat of your dreams, order the Craftprint of your choice today!

14. SEA GAL. A 15-ft. strong, stable, general-purpose outboard runabout adapted for use on open, rough waters. Seats six to eight comfortably. Convex and Vee-bottom plywood construction over longitudinal framing. \$1.00.



Outboard Cruiser—No. 24—\$1.00

24. RANGER. 17-ft. outboard cruiser. Seats four or sleeps two. Takes 25 to 50 hp motors. High-speed Vee-bottom design. All accommodations included. Plywood construction. \$1.00.

30. FALCON. 14-ft. — 118 sq. ft. sailboat of centerboard design. Faster than Snipe and Comet designs and will stick with 18-footers. Plywood construction. Sail plans included. \$1.00.

31. WHIZZ. 21-ft. high-speed cruiser designed for use with 50-60 hp inboard motors with long-cruise accommodations for two. Plywood construction over oak frames. Plans include cabin design. \$1.00.

75. KINGFISHER. 9-ft. pram ideal as auto-top boat. Seats three. Takes 1 to 3 hp motors. Weighs only 90 lbs. Plywood construction. \$1.00.

106. PETREL. 16-ft. sailer that can be built as an open-cockpit racing craft or



Multi-purpose Sloop—No. 106—\$1.00

as a cabin sailing model with accommodations for overnight trips. Can also be adapted to outboard or air-cooled inboard motors from 1 to 6 hp. Seats four. Weight complete, 850 lbs. \$1.00.

150. NANCY JANE. 19-ft. all-purpose inboard runabout of durable cockpit design with or without cabin. Takes marine or converted auto engines up to 100 hp. Single screw. Plywood construction over oak frame. \$1.00.



High Speed Runabout—No. 154—\$1.00

154. MUSTANG. 10-ft. high-speed runabout that seats three comfortably. Ideal for use with motors up to 8 hp. Good auto-top boat. Sturdy plywood construction. \$1.00.



Lightweight Racer—No. 157—\$1.00

157. SKEETER. 8-ft. lightning-fast, blunt-nosed racing hydroplane. Will take outboard motors up to 10 hp. Plywood and canvas construction makes it light and easy to handle. \$1.00.



"Hot Rod" Speedboat—No. 165—\$1.00

165. YELLOW JACKET. 8-ft. Class A racing hydroplane for use with $7\frac{1}{2}$ hp motor. Fast, seaworthy. Simple construction. \$1.00.

174. BLITZEN. 11-ft. speedy outboard runabout for Class B racing. Has been clocked at 47 mph using a 25 hp outboard motor. Two hull styles from same basic design are given—one for racing and one for general utility. Seats four persons. Plywood construction. Lends itself to quantity production. \$1.00.



Outboard Cabin Cruiser—No. 175—\$1.50

175. EAGER EVE. 18-ft. outboard cabin cruiser for racing and sports cruises. Carries four or sleeps two. Plywood construction with concealed motor in well. Vee-convex bottom and 6 ft.-1 in. beam at widest point. Hull: 600 lbs. Depth: 40 in. forward; 28 in. aft. Top speed: 30 mph. Low in cost to build—fun to run. \$1.50.

189. STAR-LITE. 27 $\frac{1}{2}$ -ft. auxiliary cruiser has ample working galley, storage space and accommodations for four persons. Primarily a sailing ship, uses auxiliary engine not exceeding 100-cu. in. displacement. Designed for easy construction using laminated plywood planking. \$2.00.



14' Sports Runabout—No. 201—\$1.50

201. PLAYBOY. Deluxe 14-ft. sports runabout for extended trips, hauling water skiers, aquaplanes, or fishing. Seats six. Weighs 300 lbs. Takes outboards 15-25 hp. Plywood construction. \$1.50.

210. SEA BABE. 15-ft. sports cruiser, ideal for trips in protected waters, hauling water skiers or aquaplanes and trolling or deep-water fishing. Sleeps two persons for overnight cruising or seats four persons. Speeds up to 32 mph with a 25 hp outboard. Handles easily on a 2-wheel trailer. \$1.50.

221. PEDAL CAT. Paddle-wheel driven catamaran which you can operate much the same as a bicycle. Will navigate in about 3 $\frac{1}{2}$ in. of water. Ideal for use in

Boat Plan Craftprints



Paddle Wheel Boat—No. 221—\$1.50

protected waters. Will not rock or tip, is noiseless. \$1.50.



Outboard Runabout—No. 233—\$1.50

233. ACE. 13-ft. outboard runabout. Takes 18 to 40 hp motors. Speeds up to 30 mph. Advanced hull design with plywood planking over frame. Excellent general family boat. \$1.50.



Outboard Hydroplane—No. 255—\$1.00

255. MINIMAX. 8-ft. speedy hydroplane for use on protected waters. Seats two. Convex bottom with high-lift afterplane. Takes 3-15 hp outboard motors. Can be carried atop auto. Built of plywood. \$1.00.

261. VOYAGEUR. 18-ft. scow-type family cabin cruiser. Seats six; sleeps four. Excellent craft for shallow water, rivers



Cabin Cruiser—No. 261—\$2.00

and lakes. With 30 hp outboard motor develops top speed of 20 mph. Plywood construction. \$2.00.



Plywood Canoe—No. 266—\$1.50

266. GLIDE-EASY. 15-ft. combination plywood and fiberglass construction. Can be used as a double-end-paddling canoe or with square stern and powered by outboard motors up to 4 hp. Includes plans for outrigger and pontoon. \$1.50.

267. SCAT CAT. 8½-ft. 3-point racing hydroplane meets requirements of Class A and B racing rules. New advanced hull design. May be built in fraction of time ordinarily required for such a craft. Three-ply air over spruce construction. \$1.50.



3-Point Racer—No. 267—\$1.50

271. JET JOE. 13-ft. utility racing hydroplane qualifies as a closed-course and

marathon racer with outboards of 25 to 35 hp. Seats five as a family runabout. Highly maneuverable. Plywood sides and decking. \$1.50.



Outboard Runabout—No. 289—\$1.50

289. STINGAREE. 14-ft. outboard runabout for water skiing, aquaplaning and general sports use on protected waters. Seats three. Speeds up to 36 mph with 35 hp motor. Monoplane bottom with lapped plywood, high-lift, afterplane. \$1.50.



Class F Racer—No. 297—\$2.50

297. AIRMARINE SPECIAL. A two-point prop-rider competition racing hydroplane for use in Class F outboard races sanctioned under the American Power Boat Association. Has been clocked at 90 mph! Construction is plywood planking over wood frame. \$2.50.

302. COLD LIGHTNING. Skeeter Class ice boat with a maximum speed exceeding 100 mph. Weighs only 275 lbs., has only 71 sq. ft. of sail area, can be built for only \$125-\$180 including cost of sails. \$2.00.

SPECIAL QUANTITY DISCOUNT

If your order is for two or more plans, you may deduct 25¢ per plan from the price listed. For two plans, you deduct 50¢; three plans 75¢; four plans \$1.00, etc.

MAIL YOUR ORDER TODAY

SCIENCE AND MECHANICS, Dept. 238
450 East Ohio St., Chicago 11, Ill.

Enclosed is \$_____ for which please send me the boat plans circled below.

These plans \$1.00.....	14	24	30
31 75 106 150 154 157 165 174 255			
These plans \$1.50 each.....			
175 201 210 221 233 266 267 271 289			
These plans \$2.00 each.....	188	261	302
This plan \$2.50.....	297		

NAME.....

ADDRESS.....

CITY, ZONE.....

STATE.....

(Sorry, no C.O.D.'s or stamps. Satisfaction guaranteed or money refunded.)

Bonanza For Inventors!

NEW PRODUCTS WANTED FOR NATIONWIDE SALES

Your new product or process may qualify—bring you success beyond your dreams! Our unique "Clearing House" for inventors, mfg.'s, investors, needs meritorious products. If accepted for testing, your item may benefit from our complete market-research, advertising, and financial-backing facilities!

We Guide You All The Way

When our scientific testing methods indicate satisfactory potential, we help promote your product—generally, in one of these ways: (1.) By securing additional financing, in exchange for business percentage; (2.) By making arrangement with manufacturer on royalty or cash-royalty basis; (3.) By showing you how to promote item yourself, on "pay-as-you-go" (out of orders) basis. Yes, if your product has merit—we can place it on the market!

Patented Products Preferred

Please send full description, photo and/or drawings (returnable). An individual analysis and recommendation will be prepared by our staff of promotion and marketing experts, and returned to you AT NO COST! Write NOW! Personal attention required limits number that can be processed.

INVENTORS MARKETING SERVICE, Dept. N36
5909 Melrose Avenue Los Angeles 38, California

GOV'T SURPLUS BARGAINS for 2 or 3' on the \$1.



You BUY DIRECT from U. S. GOV'T at AMAZING savings. Our DIRECTORY lists 100's Surplus Depots: Buy JEEPS, trucks, cars, boats, planes, tools, mach., tents, furniture, pumps, generators, compressors, motors, typewriters, etc. Send \$1.00 TODAY for list and instructions to: AVIATION SURPLUS, Dept. SM-8, Box 789, York, Penna.

"MINIATURE MACHINE SHOP"

No Bigger Than A Typewriter, Outperforms Machines Many Times its Size! That's what a popular publication says about UNIMAT in their 3 page feature story in the MAR issue. If you want a reprint of this story plus complete information about this amazing 10 in 1 combination precision tool write to:



AMERICAN EDELSTAAL, INC., UNIMAT DIV., Dept. IH, 350 8'way, N.Y. 13

1000 PHOTOGRAPHIC BARGAINS

Anything & everything photographic! Still, movie cameras, projectors, accessories, supplies, films. New or used. SAVE! Sell your surplus equipment, films, too! Send postal. Box 193-T, Peabody, Mass.

Free Book on Arthritis And Rheumatism

HOW TO AVOID CRIPPLING DEFORMITIES
Explains why drugs and medicine give only temporary relief and fail to remove the causes; tells all about a specialized non-surgical, non-medical treatment which has proven successful since 1915. Write for this 36-page FREE BOOK today.

BALL CLINIC Dept. 503 Excelsior Springs, Mo.



FIND BURIED TREASURE

GOLD, silver, coins, jewelry, strongboxes, battle relics! M-SCOPE transistorized electronic Treasure-Metal Locators detect them all. Used world-wide. Exciting! Rewarding! Guaranteed. Lightweight, super-sensitive. Indestructible fiberglass cases. From \$59.50. Easy Terms. FREE catalog.

FISHER RESEARCH LAB., INC.
Dept. SM-3 Palo Alto, Calif.

GOVERNMENT OIL LEASES LOW AS \$1 PER ACRE.

You do no drilling, pay no taxes, may realize a king-size profit without ever leaving home. Write for free map and literature.

AMERICAN OIL SCOUTS, Dept. SM
8350 Santa Monica Blvd. Los Angeles 46, Calif.

STUDY TO BE A DOCTOR of Psychology or Metaphysics

Obtain a Ps.D., Ms.D., or Ph.D. Be a Teacher, Lecturer or Accredited Practitioner. Teach others how to achieve Health, Happiness and Contentment. Overcome problems. Correspondence courses only. Write for FREE book telling how.

THE NEOTARIAN FELLOWSHIP

Desk 2, Pickwick Building Kansas City 6, Missouri

SCIENCE AND MECHANICS

SPECIAL LOW PRICE!

\$47.50

"ORIGINAL" FRONTIER® SIX-SHOOTER REVOLVER

This is the best time in twenty years that an exact copy of Col. Gal's Frontier Six-Shooter Revolver has been offered at such a low price. Don't settle for a watered down or imitator version of the real thing.

Now you can have the original Gal at a price you can afford. Really the most beautiful Frontier Six-Shooter revolver you have ever seen. Excellent for loading, plinking, home protection or just draw.

Special low price of \$47.50
Blue steel finish. 22 S&W Caliber.
Full 40 oz. weight 5 1/2" BBL.



QUICK DRAW BOLT & HOLSTER

Beautiful heavy leather outfit. Tail a K&L, but complete and ready to strap on. Special low, low, unbeatable price at only \$12.50. Speed belt size. Choice of black or natural tan. Comes in .22 cal. holster keeps only \$1.00 extra for any other caliber.

FRONTIER DERRINGER \$19.95



An exact copy of the original Frontier Derringer, now made in modern order for modern use. Perfect for plinking, home protection or just draw.

All guns in excellent condition. Shipping charges extra.

SPECIAL PRICES FOR DERRINGER PISTOLS AND ACCESSORIES

- 22 S. & W. Cal. Standard Model Blue Finish.....\$19.95
- 22 S. & W. Cal. Deluxe Model Chrome Finish.....\$24.95
- 22 Magnum Cal. Deluxe Model Chrome Finish.....\$29.95
- 38 Special Cal. Deluxe Model Chrome Finish.....\$34.95
- Western Model Holster & Cartridge bag belt.....\$ 7.50
- Detective Model Spring Clip Under pant Holster.....\$ 8.50
- Real Pearl Grip.....\$10.00
- Real English Stag Grip.....\$ 8.00

HY HUNTER FIREARMS MFG. CO., Dept. SM-9
1255 Sunset Blvd., Hollywood 48, Calif.

GUARANTEE: All guns and 100% satisfaction. No return. No refund. No exchange. No return. No refund. No exchange. No return. No refund. No exchange.



Advertisements in this section 78c a word; minimum ad accepted 10 words. Advertisements for our October 1960 issue must reach us by July 5th. Address SCIENCE AND MECHANICS, 450 E. OHIO STREET, CHICAGO 11, ILLINOIS.

ACCOUNTING & TAX SERVICE

PART-Time Bookkeeping, Accounting & Tax Service in Your Own Home. Earn \$50-\$100 Extra Income, Evenings & Weekends. Write Audit Department, Business Surveys, 120 So. La Salle St., Chicago 3, Illinois.

ADDITIONAL INCOME

MAILMAN Brings US \$150 Daily. Operate Home Mail Order Business. Write Publicity, Box 727F, Kalamazoo, Mich.

WHOLESALE Magazine Subscriptions—50¢ Commissions—Bonus. Qualified Magazines, 451-PC Kingston, Brooklyn 25, New York.

BIG Money raising Fishworms and Crickets. Free Literature. Carter Farm-Wisconsin, Georgia.

FREE Report "609 Odd, Successful Businesses." Work Home! Box 1001-SMA, Evanston, Ill.

FREE Wholesale Catalog! 100,000 Products Tremendous Discounts! Econ-O-Mart, Whippany, New Jersey.

INVISIBLE Reweaving: \$3.00 in one hour possible, reweaving burns, tears, mothholes. Spare-full time. Free details. Skill-Weave, Dept. WC-28, 335 W. Madison, Chicago 8.

GFT Money for newspaper clippings. Free details. Write: Whitted-60D, 2815 Nicholson, Davis 24, Texas.

PART Time money—Good Opportunity. Instructions \$1.00 Refundable. Graham, 350 Farmingdale Rd., Lindenhurst North, New York.

HOME Business Opportunities. Details 101 Modern Merchandise, Box 71331, SM2, Los Angeles 7, Calif.

TURN your ideas, inventions into cash, royalty. Ketchum's Advertising, B-1058-D, Springfield, Ill.

FOR details of a fascinating profitable hobby, mail 10¢ and self addressed stamped envelope to Models, Dept. SM, Box 13363, Tampa 11, Fla.

FREE Circular. Operate White Elephant Store. No stock purchase. \$250 S.E. 94th Ave., Portland 66, Oregon.

QIANTIC Mail. Unique Opportunities. Offers, 10¢. Sax, Milan 6, Ohio.

\$3,000,000.00 FUTURE, 6% Royalty paid from three inventions sales within 90 days for each \$200.00; 3% For \$100.00—1%; \$50.00—Wall Street Inventions, Investments, 210 5th Ave., Suite B-106, New York 10, N.Y.

SPARETIME Homework! Guaranteed Pay! No Selling! Elvee, 556SM Beacon, Manchester, N.H.

SELL Books By Mail Write Carlton's, 3007 Wharton, Philadelphia 46, Penna.

ADVERTISING SERVICES

ADVERTISE: 24 words, 100 Canadian Newspapers, 45.50. Lists Free. Advertising Bureau, 10311-26 Springfield, Chicago 43.

FREE! Red-hot Book, "More Profit From Your Advertising." Lists—Best mail-order magazines, newspapers. Adservice, 516-C Cornelia, Chicago 13, Ill.

AGENTS WANTED

MEN-Women Agents: sensational new money-makers—Beautifully hand-painted plastic personalized photo enlargements, complete, rich, big, beautiful, lockets, etc. Simply take orders, pocket 40% commission—we deliver and collect. Sales outfit free. Novelco, 3343 North Ave., Chicago 47.

MEXICAN art goods! Free Samples! Send 14¢ stamps mailing. Sylvair, Apartado 9336, Mexico City.

USED and New Watches \$2 up. Free List. Southern Watches, 5-SM South Wabash, Chicago 3.

EVERY Man A Prospect. Request refundable sales kit showing line of belt buckles, tie clasps, money clips, cuff links, lapels, individualized with customer's name and emblems. Cap badges for trucking, bus, taxi, police, firemen also heavy construction emblems. Choose 3000 emblems. Hook-Past, Box 1425-SM, Providence, R.I.

YOUR Free copy of World's biggest sales magazine tells you how and where to make more money on your own in selling. Specialty Salesman Magazine, Desk 8B, 307 North Michigan, Chicago 1.

START Your Own Business On Credit (U.S. and Canada). Your own boss. 1398 Dealers sold \$5,000 to \$25,500 in 1959. We supply stocks, equipment on credit, 300 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Bepko, Dept. H-U-ESB, Fresno, Calif.

CHRISTMAS Cards—with customer's name imprinted. Personal and business designs—all in one album. These deluxe cards pay deluxe commissions. Earn \$300 to \$500 per month easily this season, even in spare time. Sales experience unnecessary. Free Sales Kit includes Sample Album and easy-to-follow selling instructions. Send for Kit now; pocket profits next week! Write Process Corp. (reliable for 39 years), Dept. SM-1, 1354 S. Troy, Chicago 23, Ill.

SELL Champion, AC, Autelite spark plugs. Reconditioned, electroplated, guaranteed 10,000 miles, 100% profit. Free Sample, Lee Plugs, 1889-V Roberts, Houston 3, Texas.

BIG Money! Fast Selling Battery Up Reviver. Guaranteed. Unlimited market. Dependable Products, 9410 South Michigan, 605M Chicago 19, Ill.

UP to \$300 Extra Money. Show friends fabulous self-selling Evans Christmas Card, Gift line. Profits to 100%. Send no money—write for sample boxes to be paid for or returned, plus big Free Album Personalized Cards. Catalog 300 items. New England Art Publishers, North Abington 886, Mass.

MAKE Money sell beautiful heart necklace. Sample \$1.00. Lawler, 76 Wesley Ave., Atlantic Highlands, New Jersey.

MAKE \$100-\$1000 A Day! Sell New 5 Year Light Bulbs. Guaranteed. Send For Sample 6 Pak \$1.98. Sells for \$4.69. Free details. Sunmaster, 368 Fifth Ave., Dept. 06SMC, New York City.

AMAZING Christmas Card Profits! Mail order, no on last-calling \$1.25. Assortment; \$75.00 on 100. Gift Bonuses. Complete line; assortments, novelties, \$1.00 up. 53 Personalized samples Free; 2000 samples approval. Free Gift Offer. Creative, 4401 Cermak, Dept. 511-P, Chicago 23.

WANTED Fire Extinguisher Salesman. Huge Profits. Out-O-Matic, 1737-P East 31st Ave., Denver, Colo.

START Making Money Now. Earn top commissions taking orders for all magazine subscriptions. Friends and neighbors are your prospects. No experience needed. Write for free money-making kit. McCrory Magazine Agency, Dept. 13A, Mount Morris, Ill.

BEAUTIFUL Feather Pictures! Free Details. Sample 20¢ Stamps. Apartado 1668, Mexico 1, D.F.

NEW Bathroom Deodorizer. Hangs on wall. Banishes odors bathroom, kitchen, car. 50¢ sample. Samples sent on trial. Kristite 73, Akron, Ohio.

DOUBLE Spare-Time Earnings with 65¢ profit on exclusive, new \$1.25 Christmas Card Assortment. Imprints, 40 for \$1.50. Over 400 Assortments. Gifts retail \$1.00 up. Cash samples on approval. \$1.25 Assortment, \$1.00 Gift on Free Offers. Cardinal, 1400 State, Dept. 42-B, Cincinnati 14.

ATHLETIC EQUIPMENT

FREE Muscle Building Information; Bodytone, Box 638-D, North Miami, Fla. "BIG Muscles. The Quick Way." Dr. Young's revolutionary discovery. Free information. Gauscho, Box 9309-54, Chicago 90, Illinois.

BARNHILL Course, thoroughly explained, illustrated \$1.00. Catalog 10¢. Good Barbell, 5100m Springs, Arkansas.

AUTHOR'S SERVICE

LOOKING for a Publisher? Learn how you can have your work published, promoted, distributed. Send for Free Booklet "H." Vantage Press, 120 W. 31st Street, New York 1.

AUTO PARTS & ACCESSORIES

NEW And Used Parts At Savings. Complete guaranteed parts service for all models cars and trucks, 1924 and later. Largest in the West. Jeep and Army Parts specialists. Newest type Shifting Hubs for all Jeep, Army, and Navy, and latest production front-end drive vehicles, \$27.50 and up. Also, Foreign Car Parts. Write for book order service. Pioneer Auto and Truck Parts Co., 766 W. 13th Avenue, Denver 17, Colo.

JEOP Parts! For Military and Civilian. At great savings. Largest inventory. Catalog for owners and dealers. Inquiries invited. American Auto Parts Co., 1830-SM Locust, Kansas City, Mo.

"RING-Valve Job" while-U-drive, \$8.00 postpaid. Guaranteed! Nothing like it. Lasts 100,000 miles. Motoloy, Grantham 1, Pennsylvania.

DIBSEL Injector Parts and Fuel Pumps Wanted. OM-31-57-7-110, Buescher, 7120 Carnegie, Cleveland, Ohio.

AUTO shop welding repair training in world's largest non-profit welding school. Low tuition. Free booklet. Hobart Welders, Box S-80, Troy, Ohio.

"RING-Valve Job" while-U-drive. Only \$3.00 delivered. "World's only 100,000 mile (patented) product of its kind." "Lachapelle's." "Over million new, repeat sales. Fifteen successful years." Money back guarantee. Beware of imitations. Free information. Joe Dillon, National Distributor, Box 32319, Bridgeport, Ohio.

JUST Out! New 388-page, illustrated Catalog offering savings up to 50% on over 100,000 Auto parts and accessories. Many buy 2 to get 1. All makes. 1920 to 1960 models' trucks, foreign and sports cars. Also Hollywood accessories, custom styling, Hi-Speed Equipment. Send 25¢ for postage, packing—refundable on first order. Whitney, 1919 SM-6 Archer, Chicago 16, Ill.

RACING Car Power-Foreign Car Economy. Guaranteed. Information 10¢. George Nemo, Cedarburg, Wis.

1959-1963 FORD Parts. Illustrated catalogue 50¢. Mark Auto, Layton, New Jersey.

NEW! Voltage Regulator Checking and Adjusting Kit. For all 6 and 12 volt regulators. Meter, Tools. Simplified Instructions. Only \$9.95. Electro-Mechanic Co., 241 E. Erie St., Milwaukee 2, Wis.

GREATEST Auto Parts catalog. Thousands Racing and Restyling accessories for all cars. Only 25¢ (refundable). Newhouse Automotive Industries, 5805-SM 7, Beverly, Los Angeles 22, Calif.

SILENCE Hydraulic Valves. Free literature. Micro-Moly Products, Garrison 2, Kentucky.

AUTO TRAILERS & SUPPLIES

BUILD Expanding eight foot trailer. Accommodates five. Literature 10¢. Framar Company, Wilmington, Mass.

BARGAINS FOR EVERYONE

FANTASTIC Bargains! 160 Page Color Mail Order Catalog 30¢. Big Printing Catalog 50¢. Home Business Digest 50¢. Imports—Save Money In Parking Tickets. "Memopark" Signal Key Chain... \$5.95. Sounds Like Alarm Clock When Time Expires. "Free Catalogs" With Money! Lettner's Shopping Service, Box 481-SM, San Francisco 3, Calif.

NOW! A new way to get honest bargains. Free details. Tieszen-Wiens Co., Bridgewater, South Dakota.

BIG MAIL

YOUR Name wanted by Publishers, mailers. We'll list your name sent to 1000 concerns, your name on our list one year 38 cents. Dixie Mailers, King, C.

INTERESTING Big mail. 104 Sims. 1310 Fifth Ave., Chicago Heights, Ill.

RECEIVE Samples, magazines, catalogs, opportunities. 10¢. Star, B-7092, San Antonio 10, Texas.

GIFT Samples, Opportunities, Magazines, Catalogs, Offers, Galore! Your name in 5000 Big Mail Directories—25¢. Results Guaranteed. King's, Moorestown, Ontario, Canada.

IDEAS Plans! Bargains! Free Offers. 10¢. GEMM, 2045 68th Brooklyn 4, N. Y.

GIFT with interesting mail. 50¢. Lee, 567, San Jose, San Francisco 10.

YOUR Name on our Giant Mailing List. brings you money-making and other mail offers galore! Send 25¢ today! Direct Mail Service, Dept. GM, Box 581, Bakersfield 9, California.

"INTERNATIONAL" Big Mail. Agency Offers, Free Overseas, Foreign Catalog Rush 25¢. Porreca Imports, 157-A2 Pine, Hammonston, New Jersey.

HASTING Listing. Plenty good mail 25¢. Agents wanted. Hasting, 3821-H Cleveland 10, Ohio.

BOATS, MOTORS & MARINE SUPPLIES

NEW, Used, rebuilt marine motors. Marine conversions, fittings. Free catalog. Stokes Marine Supply, Dept. 22, Coldwater, Michigan.

MARINE Conversions. Ford, Mercury, Lincoln, Chevrolet V8, Jeep Engines. Catalog 25¢. Lehman Manufacturing Company, 800 Elizabeth Ave., Linden 5, N. J.

SAVE! Save! Save! World's Finest Boat Kits—25¢ less! Satisfaction Guaranteed! Write for free color catalog. Dept. 8MM-760, Tat Marine Woodcraft, 636 39th Ave., N.E., Minneapolis, Minn.

FRAME Kits. Plans or full-size Patterns for 35 Inboard and Outboards. Prepared for Fabricator Builders. No 80 base. Illustrative catalog—50¢. Glen, 9152 Rosecrans, Bellflower, Calif.

260 BOAT Plans. Etc. 3 Catalogs, \$1.00. Trailer Kits, \$69.50. Marinecraft, Box 161-2, Brighton, Mass.

BOAT Builder's Handbook No. 561 has step-by-step plans for 21 different craft. Send 75¢ for No. 561 to Science and Mechanics, 450 E. Ohio St., Chicago 11.

BOOKS & PERIODICALS

BOOKHUNTERS! All subjects. Send wants! Jaher Book Service, 183 Hazelwood Drive, Westbury, New York.

OUT of Print Books quickly Supplied. Murray's Bookbinding Service, 115 State St., Springfield 3, Mass.

BRITISH Book Bargains! Any Subject. Catalogues free. Transbooks, Wansagh North, New York.

FREE Catalog! Inner Development health, metaphysical books! Tapes! Recordings! Philanthropic, SMB-697, Rudston, New Mexico.

RESTAURATORS' Magazine. 3 years, \$9.00. James Cox, 1603 Downey, Ill.

ATHLETE'S Book. Catalogue Free. Truth Seeker Co., 38 Park Row, New York 6, New York.

OUT-Of-Print Books located without obligation. Any subject. Lowest prices. Book-Mark, Box 68D, Mt. Clemens, Mich.

CHANGING Times. 6 Months \$2.00. Free List Free. Pearson's, 11129 Ave. N., Chicago 17.

NAMES Of Roundbook Book Buyers on gummed labels. Sheet of 33 names—only \$1.00. Home Workshop, 705 Dunham Blvd., Chicago 11, Ill.

BUILD IT YOURSELF

AIR Conditioners, Home, Automobile. See Kool Engineering Ad Page 153.

MAKER Blocks, Bricks. Tiles for your home. establish own insulate business. cheaper than concrete, machine included—franchise \$400.00. National Insulcrete Corp., 50 Waterville Ave., Massapequa, New York.

BUILD-It-Yourself plans described in our illustrated catalog. Plans for building everything from boats to toys. Send 25¢ now for Craftprint Catalog to Science And Mechanics, 450 E. Ohio St., Chicago 11.

BUSINESS OPPORTUNITIES

IMPORT-Export opportunity, profitable, world-wide, mail-order business from home, without capital or travel abroad. Established world trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger C-718, Los Angeles 24.

\$1.00 BRINGS You \$18.00 Spare! Full time Home-Business opportunity! Amazing new velvet-spray transforms old cheap lamps, TV-radios, figurines, furniture, etc. into \$688 profit! Free samples, 50 Business Opportunities Booklet. Send No Money. Flok-Kraft Dept. At, Los Angeles 61.

\$1.00 New Greasless Doughnuts in kitchen. Sell stores. Free recipe, James. 3605 South 15th, Minneapolis 7, Minn.

OPERATE Profitable mail order Business. Write Waiter Service, 4159-G East 112nd St., Ohio.

MAKE Rubber Stamps, Repair Tools, Rebuild Batteries. Catalogue "75 Ideas" Free. Universal, Box 1076-E, Peoria, Ill.

OPPORTUNITY to earn \$15,000-\$30,000 annually. Franchise protected. Granted on \$15,000 cash live at home. No experience to buy. Self-employed. One of most exclusive and noncompetitive Businesses in United States and Canada. Send for free explanatory booklet. Farrell & Co., Box 8-H, Louisville, Illinois.

GROW Orchids at home. Profitable, fascinating. Successful home grower explains special light, temperature and humidity conditions orchids need. Free full details. Orchids, 100 S. Vermont, Los Angeles 4.

MAKE Extra Money—Big Cash Commissions plus premiums for you and your customers. Sell Advertising Book Matches—sensational new Tenoramas, Glamour Girls, Hillbillies; dozens others. All sizes—Quick daily sales; big repeat business. Free! Mail order. No experience—no experience necessary. Superior Match, Dept. VY-880, 7530 Greenwood, Chicago 19, Illinois.

CO-PUBLISH "Mail Sale Advertiser." Free monthly mail order paper. Send dime for details and latest copy. Vanroy Shirk, Box 234, Lebanon, Pa.

COLORGLAZED Concrete Pottery made without molds. Patented method. Cement products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National System, Grand Rapids, Minnesota.

MAKE figurines; cement lawn novelties. Free 12-page Rubber Stamp Catalog. Free Sample W. Wooley, 2301 E. Latrobe, Peoria, Ill.

FIX Typewriters. Free Repair Course. Home operated. Remit 25¢ for book explaining Fix Course and Agency Appointment. Ashley, Tatsumu, Pa.

GROW Mushrooms. Cellar, shed and outdoors. Spare, full time. Year round. We pay \$4.50 lb dried. We have 25,000 Patented Free Book. Mushroom, Dept. 168, 2954 Admiral Way, Seattle, Wash.

FREE Sample Of The Secret Key that has made Millions in Mail Order! Free details reveal biggest profit-making Home opportunity now available! Opportunity offered! Mail Order Importers, Dept. B88C, 15201 South Broadway, Los Angeles 61, California.

VENDING Machines—No selling. Operate route of coin machines and earn amazing profits. 32-page Catalog. Free! Parkway Machine Corporation, Dept. 57, 715 Knorr St., Baltimore 2, Md.

YOUR envelopes addressed accurately. Reasonably. Fast service. Free details. Send address in your city. Glenway System, Box 6568, Cleveland 11, Ohio.

FRANCHISES make profits! Have your own prosperous franchise business. Opportunities worldwide for Distributors, dealers, agency operators. Write today. National Franchise Reports, SM-628, 333 North Michigan, Chicago 1.

BIG Money Raising Fishworms and Crickets. Free Literature. Carter Farm-K, Plains, Georgia.

MAKE \$25-\$50 Weekly clipping newspaper items for publishers. Sample clippings worth \$5.00 each. Particulars free. National, 81-J, Knickerbocker Station, New York.

THE Law says. You must keep records. "Start-Up System" Mail Order Bookkeeping System. Only \$1.00. For small businesses. Self-employed persons, beginners. Dunnell's, 149-53 45th Ave., Flushing 55, N. Y.

BROWN Baby Shoes: Instructions. Equipment and Mountings for genuine Electroplating Process. Largest supplier of all Plating Equipment, Supplies. Free Catalog. Brownand Supply Co., Dept. B-7, 1624 East First, Los Angeles 33, Calif.

MAKE \$46 From Square Foot Plywood; Jigsaw necessary. Free Information: Woodarts, K-7, Bridgewater, Mass.

MARKETS Everywhere. Make Artistic concrete birdhouses, jewelry. Best coloring. Home workshop. Hundred varieties. Hollywood Cementcraft, 8527-W Wonderland, Hollywood 46, Calif.

BIG Money—Operate own fix-it shop. Service, repairs, tune-ups, oil changes, motors, lawns, saws, skates, etc. Free book. Christy Trades School, A-1002, 3214 W. Lawrence, Chicago 25.

IF You Like Motorcycles And Money then write for the Davidson Dealership Book on how to become a dealer of motorcycles and a new line of motor scooters. Here's a chance to own your own business with very little investment. The youth market is beginning to explode and the next few years promise a chance to cash in on it. Write for free illustrated Dealership Book today! Harley Davidson Motor Company, Dept. SM, Milwaukee 1, Wis.

\$250.00 WEEK spare time profit possible. Earn at home with new fascinating Printing method. 55 starts you—send no money now. See the Confidential Facts and Values Sample. Screen-Print, AT, Los Angeles 61.

\$34.70 TWO Hours. Manufacturing Concrete Products. No Selling. Castings #7, 1805 Fremont, Rapid City, South Dakota.

\$5.00 HOUR—Home, spare time, assembling pump lamps. Free details. Free details. Ogur, Caldwell, Arkansas.

WANT To Make Big Money At Home? \$10.00 profit in an hour possible with invisible Mending. Make tears, holes, disappear. Free Catalog. Fabric Sales, year-round demand from cleaners, laundries, homes. Details Free. Fabricom, 6246 Broadway, Chicago 40, Ill.

Big direct sales factories—Appliances, Cameras, Watches. Free Details! Cam Company, 6810SM-20th Ave., Brooklyn 4, New York.

CASH. Gift shop operator exposes trade secrets! Mail order business. American Distributors, Box 469-SM, Niles, Mich.

LEARN Appliance service and repair. Motors, washers, refrigeration, cleaners, everything. Free booklet. Appliances, 3570 W. Fire, St. Louis 4, Mo.

AMAZING! Keep \$46 each sales dollar! Make your own line of stunning Costume Jewelry. Sell itself wherever displayed! Details free. Shellcraft, Dept. XX, Box 804, Panama City, Florida.

MOLD Statuary, Pottery, Tiles, Novelties. Make money, dollar, sell! Particulars free. Marbleizing Service, Edwardsville, Ill.

\$200.00 MONTHLY. Spare Time. With Tablecloth. 1011 Gladley House, 7226 4th Flain, Vancouver, Wash.

WANTED. Men, Women, raise bait for us at home. Full, spare time. Doesn't take up space. We furnish everything. Sherburne, Dept. 14, Monterey, Calif.

LEARN "Mailorder Do's and Don'ts," other selections. 50¢. Caruthers, Box 626-B, Dania, Florida.

TWO publications "Mail Order Laws & Regulations," also "Mail Order Rules For Beginners." Free. No money licenses, Taxes, legal requirements. Each \$1.00. Circular, Dunnell's, 149-53 45th Ave., Flushing 55, N. Y.

BELOW Wholesale Sources—750,000 Items. Free Lists. All Products, Box 40-SM, Elberton, Georgia.

PUNCHBOARDS. Catalog 10¢. Delux Sales, Blue Earth, Minnesota.

SELL By Mail: High Income! Everything Furnished. Irvin, Box 1052-C, Oklahoma City 1, Okla.

BIG money making opportunity soliciting delinquent accounts. Top commissions. National Credit, 304X Pickwick Bldg., Kansas City 8, Mo.

PACKAGES AT Home For Profit! We Supply Everything. No selling; ready market. Free details. HPC, Dept. 6C, 2212 East Jesse Street, Los Angeles 23.

MONEY Making Acme Sales and Lawnmower Shareware. Finest made, easiest and most profitable to operate. Thousands of satisfied users. Terms. Free Literature. Made and guaranteed by Max Manufacturing Co., 138 Stockton Ave., San Jose 26, California.

PROFITABLE, Economical Sales Research Mimeo Business. Pen-Har Enterprises, 82 Robert, Penetang, Ontario, Canada.

RE-CAST Junk batteries into new. Latest achievements. Battery Laboratories, Bayou LaBatre, Alabama.

CASH from Sawdust, Tin-Cans, Newsprint. Over 200 methods. Instructions \$1.00. B & P's Company, 42-PPF, Norwood, Ohio.

FORTUNES in Concentrates! Products! Formulas! Free list. Blomberg, Alanson, Michigan.

"HOW To Build Your Own Mail Order Business." Start small, grow big. Unusual book. 50¢ Postpaid. Rocky Service, 6740 Waterside Road, Norfolk 2, Va.

JUNK Bicycles Available By The Thousands. Turn them into cash. Instructions \$1.00. Boldt, 818 N. Waite, Sioux Falls, South Dakota.

ENGRAVE Plastics! Enjoy your own fascinating hobby-business, engraving, carving, personalizing. Discover profits to \$100 an hour. Details, sample 20¢. Desco Distrib., 4329-GS Woodman, Van Nuys, California.

OPERATE Home Mail Order Business. Write: Gray Distributors, 83 SMO, Gray, Georgia.

FREE International Trade Bulletin. 40 stamp. Drop-shippings. Western Activities, 1730 WL 7th, Los Angeles 17, Calif.

ANALYSIS of 30 successful businesses and how you can duplicate them in income opportunities. Handbook. Send 7¢ for No. 550 to Science and Mechanics, 450 E. Ohio St., Chicago 11.

BUY IT WHOLESALE

SECRETS of Wholesale Buying revealed in new directory. Free details. Meder, 850-BM Fifth Ave., New York 36.

1959 CARS, GAS, Oil, Tires, Insurance, at discount. Buy everything wholesale! Miracle Plan. Write Clinton, Box 292CM, Kalamazoo, Mich.

New Deluxe wholesale Catalog. automobile catalog, and others. Housewares, appliances, refrigerators, freezers, washers, dryers, television, radios, furniture, clothing, luggage, binoculars, photographs, recorders, cameras, projectors, typewriters, power tools, toys, sporting goods, watches, jewelry. Name brands. Huge discounts. Postcard (any card): Selbyco, Decatur 203, Illinois.

LARGEST Wholesale Supply Source in United States. Get free catalogs. Furniture, clothing, appliances, autos and accessories, farm equipment, tools, housewares, hobby supplies. Free details. Associated Wholesalers, Box 2068-B, St. Louis 4, Mo.

IBM WRITERS, Adders, Calculators, Typewriter Cases \$89.50. Standards \$17.50. Free Catalog. Gilbert, Dept. 6, 149 Oxford St., West Plains, New York.

2,000 PAGES Wholesale Catalogs Write: Monase, Box 47, Newark, Ohio.

"NOW!" Giant Wholesale Catalog \$1.00 (deductible). Earl Johnson, Hudson, Indiana.

FREE! America's most unusual bargain catalog. Post card: Spartan, 1236-K Winona, Chicago 40.

CAMERAS & PHOTO SUPPLIES

PHOTOGRAPHY For Pleasure or Profit. Learn at home. Practical basic training. Long established school. Free booklet. American School of Photography, 835 Diverway Parkway, Dept. 354C, Chicago 14, Illinois.

CAMPING EQUIPMENT & TENTS

CAMPING Equipment, tents, world's largest selection. Send 25¢ for new 160 page Catalogue-Handbook-Camp Site Directory. (Print name-address). Morsan Tents, 10-21K 50th Ave., Long Island City 1, N. Y.

CARTOONING, COMMERCIAL ART & SIGN PAINTING

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free! no obligation. Simply address Cartoonists' Exchange, Dept. 138, Pleasant Hill, Ohio.

Sign painting taught at home. Test letters free. Ben Korns, Box 812-SM, Greenville, South Carolina.

Sign Painting. Earn while learning. Straco, 410 So. Western, Springfield, Ohio.

CARTOONING for Profit! Learn at home, experience unnecessary. Famous System of Manual Training teaches amazing results. Free book, write Continental Schools, D-71, 4201 S. Broadway, Los Angeles 37, Calif.

CARTOONING teaches you cartooning in a new 24 lesson course. Free brochure. CFA, Box 263-C, Branford, Conn.

ART—Learn at home. Earn big money. Learn Commercial art, cartooning, lettering, figure drawing, painting, TV art, in spare time. All for \$65 a day. Send for free School Catalog. No obligation. Washington School of Art, Studio 478X, Port Washington, N. Y. (Tear this out as reminder).

CHEMICALS & APPARATUS

CHEMICALS. Laboratory Apparatus. Glassware, Microscopy Supplies. Catalog 254-75. Biological Supply Co., Rochester 20, N. Y.

SPECTROSCOPE for quick analysis \$3. Cuttingboards, 875 Arastradero, Palo Alto, California.

EXPERIMENTERS: New, Bigger Catalog And "Booklet of Experiments." Only 25¢. Hazenow Laboratories, Manitowoc, Wisconsin.

ECONOMICALLY Priced! Laboratory Microbiology Catalog—204. Starr Scientific, Manitowoc, Wis.

CHEMICAL Predictor. Amazing new calculator scientifically illustrates and tells if 10,000 Chemical reactions will occur. All plastic. Send \$2.25. Dyna-Slide, 609 South Michigan, Chicago, Ill.

CATALOG with 3,000 illustrations \$2.00. Laboratory Materials, 7319 Vincennes, Chicago 21.

ILLUSTRATED Catalog 25¢. Chemistry Microbiology. Ecology. Tracey Laboratories, Evanston, Ill.

EDUCATIONAL, professional, laboratory kits, imported research-microscopy, bacteriology, hydrobiology, mineralogy. Catalog 254. Jockel Manufacturing, 309 East 14th, New York 3.

MICROSCOPE Study Slides. Bacteria, blood, tissues. Send \$1.00 to: Microslides, 1025 Cynthera, Pasadena, Calif.

CHEMISTRY Catalog 25¢. Expendibles Kit. Write: Offer Laboratory Sales, Box 161-D, Brighton, Mass.

SMALL quantity chemicals, glassware, apparatus, set re-fills. Illustrated Catalog 25¢. Bio Chemical Products, 30 N. Somerset, Belmont 78, Mass.

COINS, CURRENCY & TOKENS

SIXTEEN page 1960 retail price list of U.S.A. and Canadian coins for 10¢. Our selling prices on thousands of coins and coin collectors supplies. Bryson Incorporated, 612D White, Toledo 5, Ohio.

BEAUTIFUL Official Bronze Medals—Alaska \$4.95, Hawaii \$4.50. Fifteen different designs. Order \$2.95. Brilliant Proof sets—1957 \$5.95; 1958 \$5.10; 1959 \$4.85; 1960 \$3.95. Beebe's, 4514 North 30th, Omaha 11, Neb.

LARSEN CC Mint Dollar 1985 Unrestricted \$1.00. Illustrated Catalogue 50¢. Shultz, Salt Lake City 10, Utah.

OLD Coins Bought. Illustrated Catalog 25¢. Hutchinson's, P.O. Box 4747, Philadelphia 34, Penna.

\$8,000 in 1913 Liberty Head Nickel. We paid \$4,500.00 for one Silver Dollar, \$3,300.00 for one Cent. Thousands of others we paid \$20.00 to \$1,400.00 each. Wanted Certain Dates—Cents before 1932 \$2.00.00; Nickels before 1909 \$27.00; Dimes before 1943—\$4,000.00. Canadian Coins—1921—Nickel \$200.00, 1889—Dime—\$200.00, 1875 Quarter \$75.00, 1921—6¢—\$200.00. Hundreds of others. Distributor Catalogue worth \$100.00 to \$25,000.00 each. For Complete Ailcoin Information, before sending coins, purchase our large illustrated Guaranteed Buying-Selling Catalogue \$1.00. Catalogue dollar refundable. Thousands of persons have sold us coins. Incorporated 1938. Worthycoin Corporation, (K-420-C), Boston 8, Mass.

LINCOLN Cents 14 different before 1921 \$1.00. Price List 10¢. R & M Coins, Delanco, New Jersey.

SIX different Indian Cents \$1.00; Free List collector's Bargains. Box 56-J, New Hope, Penna.

COINS from Formosa, Vatican, etc., plus foreign banknote, 10¢ with coin approvals. Littleton Coin Company, Littleton, Colo. New Hampshire.

SAMPLE "Numismatics!" 10¢. Six issues 40¢. Box 59, Northwood, New Hampshire.

\$40-\$500 PAID for 59 circulating Lincoln pennies. Album, information—\$1.00. Sarhan Enterprises, Box 118, Colvin Station, Syracuse, New York.

LINCOLNS 25 different 1909-1934, \$1.50. Harris, 1457 Moreno, Oceanside 10, Calif.

SPECIAL Old Morgan dime, quarter, half dollar, 28 page catalog, \$2.00. Hobby Sales, Box 4054, St. Paul 16, Minn.

8 DIFFERENT Indian Cents \$1.00, 6 Different Liberty Nickels \$1.00. I. Doktor, P.O. Box 35151, Los Angeles 35, Calif.

CASH for Your Coins, catalog of prices paid for U.S. coins, order now! Don't delay! Only 50¢. The LWR Co., Dept. SM, Box 7, Greenwood, Mass.

LINCOLN Cents 1921-S, 1927-S-D, 1928-S-D, 1929-S-D, 1935-S, 1936-S-D, 1938-S-D, 1939-S-D, 1940-S-D, 1941-S-D, 1942-S-D, 1943-S-D, 1944-S-D, 1945-S-D, 1946-S-D, 1947-S-D, 1948-S-D, 1949-S-D, 1950-S-D, 1951-S-D, 1952-S-D, 1953-S-D, 1954-S-D, 1955-S-D, 1956-S-D, 1957-S-D, 1958-S-D, 1959-S-D, 1960-S-D, 1961-S-D, 1962-S-D, 1963-S-D, 1964-S-D, 1965-S-D, 1966-S-D, 1967-S-D, 1968-S-D, 1969-S-D, 1970-S-D, 1971-S-D, 1972-S-D, 1973-S-D, 1974-S-D, 1975-S-D, 1976-S-D, 1977-S-D, 1978-S-D, 1979-S-D, 1980-S-D, 1981-S-D, 1982-S-D, 1983-S-D, 1984-S-D, 1985-S-D, 1986-S-D, 1987-S-D, 1988-S-D, 1989-S-D, 1990-S-D, 1991-S-D, 1992-S-D, 1993-S-D, 1994-S-D, 1995-S-D, 1996-S-D, 1997-S-D, 1998-S-D, 1999-S-D, 2000-S-D, 2001-S-D, 2002-S-D, 2003-S-D, 2004-S-D, 2005-S-D, 2006-S-D, 2007-S-D, 2008-S-D, 2009-S-D, 2010-S-D, 2011-S-D, 2012-S-D, 2013-S-D, 2014-S-D, 2015-S-D, 2016-S-D, 2017-S-D, 2018-S-D, 2019-S-D, 2020-S-D, 2021-S-D, 2022-S-D, 2023-S-D, 2024-S-D, 2025-S-D, 2026-S-D, 2027-S-D, 2028-S-D, 2029-S-D, 2030-S-D, 2031-S-D, 2032-S-D, 2033-S-D, 2034-S-D, 2035-S-D, 2036-S-D, 2037-S-D, 2038-S-D, 2039-S-D, 2040-S-D, 2041-S-D, 2042-S-D, 2043-S-D, 2044-S-D, 2045-S-D, 2046-S-D, 2047-S-D, 2048-S-D, 2049-S-D, 2050-S-D, 2051-S-D, 2052-S-D, 2053-S-D, 2054-S-D, 2055-S-D, 2056-S-D, 2057-S-D, 2058-S-D, 2059-S-D, 2060-S-D, 2061-S-D, 2062-S-D, 2063-S-D, 2064-S-D, 2065-S-D, 2066-S-D, 2067-S-D, 2068-S-D, 2069-S-D, 2070-S-D, 2071-S-D, 2072-S-D, 2073-S-D, 2074-S-D, 2075-S-D, 2076-S-D, 2077-S-D, 2078-S-D, 2079-S-D, 2080-S-D, 2081-S-D, 2082-S-D, 2083-S-D, 2084-S-D, 2085-S-D, 2086-S-D, 2087-S-D, 2088-S-D, 2089-S-D, 2090-S-D, 2091-S-D, 2092-S-D, 2093-S-D, 2094-S-D, 2095-S-D, 2096-S-D, 2097-S-D, 2098-S-D, 2099-S-D, 2100-S-D, 2101-S-D, 2102-S-D, 2103-S-D, 2104-S-D, 2105-S-D, 2106-S-D, 2107-S-D, 2108-S-D, 2109-S-D, 2110-S-D, 2111-S-D, 2112-S-D, 2113-S-D, 2114-S-D, 2115-S-D, 2116-S-D, 2117-S-D, 2118-S-D, 2119-S-D, 2120-S-D, 2121-S-D, 2122-S-D, 2123-S-D, 2124-S-D, 2125-S-D, 2126-S-D, 2127-S-D, 2128-S-D, 2129-S-D, 2130-S-D, 2131-S-D, 2132-S-D, 2133-S-D, 2134-S-D, 2135-S-D, 2136-S-D, 2137-S-D, 2138-S-D, 2139-S-D, 2140-S-D, 2141-S-D, 2142-S-D, 2143-S-D, 2144-S-D, 2145-S-D, 2146-S-D, 2147-S-D, 2148-S-D, 2149-S-D, 2150-S-D, 2151-S-D, 2152-S-D, 2153-S-D, 2154-S-D, 2155-S-D, 2156-S-D, 2157-S-D, 2158-S-D, 2159-S-D, 2160-S-D, 2161-S-D, 2162-S-D, 2163-S-D, 2164-S-D, 2165-S-D, 2166-S-D, 2167-S-D, 2168-S-D, 2169-S-D, 2170-S-D, 2171-S-D, 2172-S-D, 2173-S-D, 2174-S-D, 2175-S-D, 2176-S-D, 2177-S-D, 2178-S-D, 2179-S-D, 2180-S-D, 2181-S-D, 2182-S-D, 2183-S-D, 2184-S-D, 2185-S-D, 2186-S-D, 2187-S-D, 2188-S-D, 2189-S-D, 2190-S-D, 2191-S-D, 2192-S-D, 2193-S-D, 2194-S-D, 2195-S-D, 2196-S-D, 2197-S-D, 2198-S-D, 2199-S-D, 2200-S-D, 2201-S-D, 2202-S-D, 2203-S-D, 2204-S-D, 2205-S-D, 2206-S-D, 2207-S-D, 2208-S-D, 2209-S-D, 2210-S-D, 2211-S-D, 2212-S-D, 2213-S-D, 2214-S-D, 2215-S-D, 2216-S-D, 2217-S-D, 2218-S-D, 2219-S-D, 2220-S-D, 2221-S-D, 2222-S-D, 2223-S-D, 2224-S-D, 2225-S-D, 2226-S-D, 2227-S-D, 2228-S-D, 2229-S-D, 2230-S-D, 2231-S-D, 2232-S-D, 2233-S-D, 2234-S-D, 2235-S-D, 2236-S-D, 2237-S-D, 2238-S-D, 2239-S-D, 2240-S-D, 2241-S-D, 2242-S-D, 2243-S-D, 2244-S-D, 2245-S-D, 2246-S-D, 2247-S-D, 2248-S-D, 2249-S-D, 2250-S-D, 2251-S-D, 2252-S-D, 2253-S-D, 2254-S-D, 2255-S-D, 2256-S-D, 2257-S-D, 2258-S-D, 2259-S-D, 2260-S-D, 2261-S-D, 2262-S-D, 2263-S-D, 2264-S-D, 2265-S-D, 2266-S-D, 2267-S-D, 2268-S-D, 2269-S-D, 2270-S-D, 2271-S-D, 2272-S-D, 2273-S-D, 2274-S-D, 2275-S-D, 2276-S-D, 2277-S-D, 2278-S-D, 2279-S-D, 2280-S-D, 2281-S-D, 2282-S-D, 2283-S-D, 2284-S-D, 2285-S-D, 2286-S-D, 2287-S-D, 2288-S-D, 2289-S-D, 2290-S-D, 2291-S-D, 2292-S-D, 2293-S-D, 2294-S-D, 2295-S-D, 2296-S-D, 2297-S-D, 2298-S-D, 2299-S-D, 2300-S-D, 2301-S-D, 2302-S-D, 2303-S-D, 2304-S-D, 2305-S-D, 2306-S-D, 2307-S-D, 2308-S-D, 2309-S-D, 2310-S-D, 2311-S-D, 2312-S-D, 2313-S-D, 2314-S-D, 2315-S-D, 2316-S-D, 2317-S-D, 2318-S-D, 2319-S-D, 2320-S-D, 2321-S-D, 2322-S-D, 2323-S-D, 2324-S-D, 2325-S-D, 2326-S-D, 2327-S-D, 2328-S-D, 2329-S-D, 2330-S-D, 2331-S-D, 2332-S-D, 2333-S-D, 2334-S-D, 2335-S-D, 2336-S-D, 2337-S-D, 2338-S-D, 2339-S-D, 2340-S-D, 2341-S-D, 2342-S-D, 2343-S-D, 2344-S-D, 2345-S-D, 2346-S-D, 2347-S-D, 2348-S-D, 2349-S-D, 2350-S-D, 2351-S-D, 2352-S-D, 2353-S-D, 2354-S-D, 2355-S-D, 2356-S-D, 2357-S-D, 2358-S-D, 2359-S-D, 2360-S-D, 2361-S-D, 2362-S-D, 2363-S-D, 2364-S-D, 2365-S-D, 2366-S-D, 2367-S-D, 2368-S-D, 2369-S-D, 2370-S-D, 2371-S-D, 2372-S-D, 2373-S-D, 2374-S-D, 2375-S-D, 2376-S-D, 2377-S-D, 2378-S-D, 2379-S-D, 2380-S-D, 2381-S-D, 2382-S-D, 2383-S-D, 2384-S-D, 2385-S-D, 2386-S-D, 2387-S-D, 2388-S-D, 2389-S-D, 2390-S-D, 2391-S-D, 2392-S-D, 2393-S-D, 2394-S-D, 2395-S-D, 2396-S-D, 2397-S-D, 2398-S-D, 2399-S-D, 2400-S-D, 2401-S-D, 2402-S-D, 2403-S-D, 2404-S-D, 2405-S-D, 2406-S-D, 2407-S-D, 2408-S-D, 2409-S-D, 2410-S-D, 2411-S-D, 2412-S-D, 2413-S-D, 2414-S-D, 2415-S-D, 2416-S-D, 2417-S-D, 2418-S-D, 2419-S-D, 2420-S-D, 2421-S-D, 2422-S-D, 2423-S-D, 2424-S-D, 2425-S-D, 2426-S-D, 2427-S-D, 2428-S-D, 2429-S-D, 2430-S-D, 2431-S-D, 2432-S-D, 2433-S-D, 2434-S-D, 2435-S-D, 2436-S-D, 2437-S-D, 2438-S-D, 2439-S-D, 2440-S-D, 2441-S-D, 2442-S-D, 2443-S-D, 2444-S-D, 2445-S-D, 2446-S-D, 2447-S-D, 2448-S-D, 2449-S-D, 2450-S-D, 2451-S-D, 2452-S-D, 2453-S-D, 2454-S-D, 2455-S-D, 2456-S-D, 2457-S-D, 2458-S-D, 2459-S-D, 2460-S-D, 2461-S-D, 2462-S-D, 2463-S-D, 2464-S-D, 2465-S-D, 2466-S-D, 2467-S-D, 2468-S-D, 2469-S-D, 2470-S-D, 2471-S-D, 2472-S-D, 2473-S-D, 2474-S-D, 2475-S-D, 2476-S-D, 2477-S-D, 2478-S-D, 2479-S-D, 2480-S-D, 2481-S-D, 2482-S-D, 2483-S-D, 2484-S-D, 2485-S-D, 2486-S-D, 2487-S-D, 2488-S-D, 2489-S-D, 2490-S-D, 2491-S-D, 2492-S-D, 2493-S-D, 2494-S-D, 2495-S-D, 2496-S-D, 2497-S-D, 2498-S-D, 2499-S-D, 2500-S-D, 2501-S-D, 2502-S-D, 2503-S-D, 2504-S-D, 2505-S-D, 2506-S-D, 2507-S-D, 2508-S-D, 2509-S-D, 2510-S-D, 2511-S-D, 2512-S-D, 2513-S-D, 2514-S-D, 2515-S-D, 2516-S-D, 2517-S-D, 2518-S-D, 2519-S-D, 2520-S-D, 2521-S-D, 2522-S-D, 2523-S-D, 2524-S-D, 2525-S-D, 2526-S-D, 2527-S-D, 2528-S-D, 2529-S-D, 2530-S-D, 2531-S-D, 2532-S-D, 2533-S-D, 2534-S-D, 2535-S-D, 2536-S-D, 2537-S-D, 2538-S-D, 2539-S-D, 2540-S-D, 2541-S-D, 2542-S-D, 2543-S-D, 2544-S-D, 2545-S-D, 2546-S-D, 2547-S-D, 2548-S-D, 2549-S-D, 2550-S-D, 2551-S-D, 2552-S-D, 2553-S-D, 2554-S-D, 2555-S-D, 2556-S-D, 2557-S-D, 2558-S-D, 2559-S-D, 2560-S-D, 2561-S-D, 2562-S-D, 2563-S-D, 2564-S-D, 2565-S-D, 2566-S-D, 2567-S-D, 2568-S-D, 2569-S-D, 2570-S-D, 2571-S-D, 2572-S-D, 2573-S-D, 2574-S-D, 2575-S-D, 2576-S-D, 2577-S-D, 2578-S-D, 2579-S-D, 2580-S-D, 2581-S-D, 2582-S-D, 2583-S-D, 2584-S-D, 2585-S-D, 2586-S-D, 2587-S-D, 2588-S-D, 2589-S-D, 2590-S-D, 2591-S-D, 2592-S-D, 2593-S-D, 2594-S-D, 2595-S-D, 2596-S-D, 2597-S-D, 2598-S-D, 2599-S-D, 2600-S-D, 2601-S-D, 2602-S-D, 2603-S-D, 2604-S-D, 2605-S-D, 2606-S-D, 2607-S-D, 2608-S-D, 2609-S-D, 2610-S-D, 2611-S-D, 2612-S-D, 2613-S-D, 2614-S-D, 2615-S-D, 2616-S-D, 2617-S-D, 2618-S-D, 2619-S-D, 2620-S-D, 2621-S-D, 2622-S-D, 2623-S-D, 2624-S-D, 2625-S-D, 2626-S-D, 2627-S-D, 2628-S-D, 2629-S-D, 2630-S-D, 2631-S-D, 2632-S-D, 2633-S-D, 2634-S-D, 2635-S-D, 2636-S-D, 2637-S-D, 2638-S-D, 2639-S-D, 2640-S-D, 2641-S-D, 2642-S-D, 2643-S-D, 2644-S-D, 2645-S-D, 2646-S-D, 2647-S-D, 2648-S-D, 2649-S-D, 2650-S-D, 2651-S-D, 2652-S-D, 2653-S-D, 2654-S-D, 2655-S-D, 2656-S-D, 2657-S-D, 2658-S-D, 2659-S-D, 2660-S-D, 2661-S-D, 2662-S-D, 2663-S-D, 2664-S-D, 2665-S-D, 2666-S-D, 2667-S-D, 2668-S-D, 2669-S-D, 2670-S-D, 2671-S-D, 2672-S-D, 2673-S-D, 2674-S-D, 2675-S-D, 2676-S-D, 2677-S-D, 2678-S-D, 2679-S-D, 2680-S-D, 2681-S-D, 2682-S-D, 2683-S-D, 2684-S-D, 2685-S-D, 2686-S-D, 2687-S-D, 2688-S-D, 2689-S-D, 2690-S-D, 2691-S-D, 2692-S-D, 2693-S-D, 2694-S-D, 2695-S-D, 2696-S-D, 2697-S-D, 2698-S-D, 2699-S-D, 2700-S-D, 2701-S-D, 2702-S-D, 2703-S-D, 2704-S-D, 2705-S-D, 2706-S-D, 2707-S-D, 2708-S-D, 2709-S-D, 2710-S-D, 2711-S-D, 2712-S-D, 2713-S-D, 2714-S-D, 2715-S-D, 2716-S-D, 2717-S-D, 2718-S-D, 2719-S-D, 2720-S-D, 2721-S-D, 2722-S-D, 2723-S-D, 2724-S-D, 2725-S-D, 2726-S-D, 2727-S-D, 2728-S-D, 2729-S-D, 2730-S-D, 2731-S-D, 2732-S-D, 2733-S-D, 2734-S-D, 2735-S-D, 2736-S-D, 2737-S-D, 2738-S-D, 2739-S-D, 2740-S-D, 2741-S-D, 2742-S-D, 2743-S-D, 2744-S-D, 2745-S-D, 2746-S-D, 2747-S-D, 2748-S-D, 2749-S-D, 2750-S-D, 2751-S-D, 2752-S-D, 2753-S-D, 2754-S-D, 2755-S-D, 2756-S-D, 2757-S-D, 2758-S-D, 2759-S-D, 2760-S-D, 2761-S-D, 2762-S-D, 2763-S-D, 2764-S-D, 2765-S-D, 2766-S-D, 2767-S-D, 2768-S-D, 2769-S-D, 2770-S-D, 2771-S-D, 2772-S-D, 2773-S-D, 2774-S-D, 2775-S-D, 2776-S-D, 2777-S-D, 2778-S-D, 2779-S-D, 2780-S-D, 2781-S-D, 2782-S-D, 2783-S-D, 2784-S-D, 2785-S-D, 2786-S-D, 2787-S-D, 2788-S-D, 2789-S-D, 2790-S-D, 2791-S-D, 2792-S-D, 2793-S-D, 2794-S-D, 2795-S-D, 2796-S-D, 2797-S-D, 2798-S-D, 2799-S-D, 2800-S-D, 2801-S-D, 2802-S-D, 2803-S-D, 2804-S-D, 2805-S-D, 2806-S-D, 2807-S-D, 2808-S-D, 2809-S-D, 2810-S-D, 2811-S-D, 2812-S-D, 2813-S-D, 2814-S-D, 2815-S-D, 2816-S-D, 2817-S-D, 2818-S-D, 2819-S-D, 2820-S-D, 2821-S-D, 2822-S-D, 2823-S-D, 2824-S-D, 2825-S-D, 2826-S-D, 2827-S-D, 2828-S-D, 2829-S-D, 2830-S-D, 2831-S-D, 2832-S-D, 2833-S-D, 2834-S-D, 2835-S-D, 2836-S-D, 2837-S-D, 2838-S-D, 2839-S-D, 2840-S-D, 2841-S-D, 2842-S-D, 2843-S-D, 2844-S-D, 2845-S-D, 2846-S-D, 2847-S-D, 2848-S-D, 2849-S-D, 2850-S-D, 2851-S-D, 2852-S-D, 2853-S-D, 2854-S-D, 2855-S-D, 2856-S-D, 2857-S-D, 2858-S-D, 2859-S-D, 2860-S-D, 2861-S-D, 2862-S-D, 2863-S-D, 2864-S-D, 2865-S-D, 2866-S-D, 2867-S-D, 2868-S-D, 2869-S-D, 2870-S-D, 2871-S-D, 2872-S-D, 2873-S-D, 2874-S-D, 2875-S-D, 2876-S-D, 2877-S-D, 2878-S-D, 2879-S-D, 2880-S-D, 2881-S-D, 2882-S-D, 2883-S-D, 2884-S-D, 2885-S-D, 2886-S-D, 2887-S-D, 2888-S-D,

EDUCATION & INSTRUCTION

USED Correspondence Courses and Books sold and rented. Money-back guarantee. Free catalog. (Courses Bought.) Lee Mountain, Pisawah, Ala.

BE A Real Estate Broker, Insure Security for yourself and your family. Study at home. Prepare for state examination. Get approved. Write for Free Book Today. Weaver School of Real Estate, 2018-U Grand, Kansas City, Mo.

COMPLETE Your High School at home in spare time with 43-year-old school. Turn in, furnish. No classes. Diploma. Information booklet free. American School, Dept. XC13, Drexel at 56th, Chicago 37, Ill.

HIGH School Diploma at home. Licensed teachers. Approved materials. Southern States Academy, Station E-4, Atlanta, Ga.

PHYSICAL Therapy and Massage pays big profits. Learn at home. Free catalog. National Institute, Desk 30, 150 East Ontario, Chicago 11.

LEARN Physical Therapy. Massage. Drugless Therapy, Box 303-S, Council, Idaho.

WANT A Diesel Job? Higher pay? Advancement? How can we help you qualify? Complete Diesel, Tractor and Heavy Equipment and Cummins Diesel Engine School. Home training courses available. Write today. Interstate Training Service, Dept. B-5, Portland 12, Ore.

USED Correspondence Courses. Education. Books. Satisfaction Guaranteed. Catalog 104. Refundable. (Courses Bought) Bayles, 18-A Courtright, Wilkes Barre, Pennsylvania.

LEARN While Aleep with your recorder, phonograph or amazing new "Electronic Educator" endless tape recorder. Details free. Research Association, Box 24-CC, Olympia, Washington.

OWN A collection agency Pays big. Franklin Credit, Roanoke, Virginia.

PROFITABLE welding training available. Hobart Welding School, Box 8-01, Troy, Ohio. GI approved. Finest equipment in U.S.A. Reasonable prices. Request catalog.

BOOKS. Free General Catalog, 100 pages. Text, vocational, educational, instructional studies. Millions of volumes new and used. Free catalog. Books bought. Est. 1905. Long's College Book Co., Dept. SM, Columbus 1, Ohio.

HIGH School at home. No classes. Texts furnished. Diploma awarded. If 17 or over and left school write for Free assignment and catalog. Correspondence of LaSalle Extension University. A Correspondence Institution. Dept. 666-WC, 419 S. Dearborn, Chicago 5, Ill.

WATCH Respiring Pay at home. Free sample lesson. Chicago School, Dept. 5C80, 2330 Milwaukee, Chicago 47.

LEARN Civil and Criminal Investigation at home. Earn steady, good pay. Institute Applied Science, 920 Sunnyside, Dept. 22, Chicago 40, Ill.

LEARN Appliance service and repair. Motors, washers, refrigeration, cleaners, everything. Free booklet. Appliance, 3970 W. First St., Los Angeles 4, Calif.

LEARN Tile Setting at home. Free details. American Trade Tile Setting, Box #217, Oakland 4, Calif.

STUDY to be a Doctor of Psychology, Metaphysics, Divinity or Parapsychology. Correspondence courses only. Neutarian Fellowship, Dept. 25, Kansas City 8, Mo.

STUDY for Doctor's Degree of Psychology, Metaphysics and Divinity. Correspondence courses only. College of Divine Metaphysics, Dept. S-M 2611 North Illinois, Indianapolis 6, Ind.

ANTENNA. Free with diving instructions. Stillwater, Box 3975 Morris Plains, New Jersey.

YOGA training at home brings you new energy, self-confidence, and a better way of life! Profit now from the wisdom of the Yogi. Send for free trial lesson in Yoga, today! Enclose 25¢ for handling, postage. Insight School, Dept. 260A, 845 Chicago Avenue, Evanston, Ill.

NEW self-teaching course in memory helps you achieve great success in business and social world. Free booklet. Memory Studies, 835 Diversity Parkway, Dept. 354C, Chicago 14.

DETECTIVE Training - Free booklet covering approved Home-Study Plan. Write National Detective Academy, Dept. E, 722 West Chapman Ave., Orange, Calif.

LEARN Auctioneering. Free catalog. Missouri Auction School, Box 9252X4, Kansas City, Missouri.

MEN, 17 to 45, Train Now As Heavy Equipment Operators. Enormous nationwide highway and building program has career fields for thousands of men. No interference with present job. Full, practical training with latest machines following completion of preparatory instruction. Information Free. No Obligation. Write to Heavy Equipment Training, University Schools, Dept. U-17, 11 E. 47 St., New York 17, N.Y.

OPERATE A Collection Agency. Pays big profits in short time. Retired expert now tells how. Send \$5.00 for complete instruction. Victor, P.O. Box 52, Appleton, Wisconsin.

DIVERS - Training in advanced methods of construction, salvage and general commercial diving for men. Free brochure. Commercial School of Deep Sea Diving, Inc., 2301 E. Anaheim, Wilmington, California.

ELECTRIC TRAINS & ACCESSORIES

LIONEL Trains. Big Discounts. Bulletin Free. Catalog 25¢. Mack Brothers, 2045 Chicago Avenue, Chicago 22.

ELECTRICAL EQUIPMENT & SUPPLIES

WINDING Data, listing 275 motors, single and three phase, \$1.10. Data Service, 512 Kensington, Kansas City 24, Mo.

ELECTRIC BRIDGE. Engraves all Metals, \$200. Beyer Mfg., 10511-V Springfield, Chicago 43, Ill.

REWIND Motors Yourself. Complete Instructions \$1.00. Lewis Manufacturing, Street 24, Mich.

BOOK - "200 Electric Stunts" \$1.00. Cuttingsboro, 875 Arastradero, Palo Alto, California.

MOTOR rewinding specifications - disassembly instructions. Modern, Box 8713, Kansas City 14, Mo.

APPLIANCE - Lamp parts wholesale. Two Illustrated catalogues 26¢. Seco, 28 South 27th Street, Birmingham 1, Ala.

EMPLOYMENT SERVICES

HIGH Pay Overseas & Domestic Jobs. Men, Women, Generous Benefits. Companies Pay Transportation. For Information write: World Wide, Dept. 1, 149 N. Franklin St., Hempstead, N.Y.

DISCOVER How to get a really good job whether now employed or not. For complete confidential information, write: Winter-Wiechert, 30 Athens, Cambridge, Massachusetts.

FARMS, ACREAGE & REAL ESTATE

FLORIDA - Nice homesites, \$345 at \$10 monthly. Folder Free. Wynn Vernor, Deland, Florida.

CANADIAN Vacation Lands: Full price \$400. 40 acres, \$10.00 month. Suitable cottages, also hunting, fishing, investment. Free information. Land Corporation, 130H Shaftesbury, Downsview, Ontario, Canada.

FILMS DEVELOPED & PRINTED

ROLL developed & beautiful enlarged prints 35¢. 25¢. Reprints 5¢. Willard's, Box 26047, Cleveland, Ohio.

FIREARMS & AMMUNITION

JAP 7.7, altered 30-06, \$6.00; 5.5-287, \$6.00; 7.7 shells, \$3.95; 5.5, \$4.20. Catalog 10¢. Top Shop, West Branch, Michigan.

FISHING TACKLE, BAIT & LURES

FREE . . . Wholesale Catalog. Beads, Spinners, Lure parts, Tools, Sinkers, molds, Jigs, Baits, Feathers, Rod blanks, Reels, Flinnysports (JD), Toledo 6, Ohio.

FOR INVENTORS

INVENTORS! If you have an invention for sale, patented or unpatented, write the Inventors of American Inventors, Dept. 1B, 635, H. E. Peters, Washington 25, D.C.

IDEAS - Protected legally without patent or copyright. Technical Service, Box 282, Woodcliff Station, North Bergen, N.J.

INVENTORS! Why be broke? Turn your invention into cash. If salable, we can sell it. Write Universal Inventions, Box 298, Marion, Ohio.

INVENTIONS Wanted now by my manufacturer clients. Patented. Unpatented. Write Gilbert Adams, Patent Broker, 80 Wall St., Financial District, New York City.

PROFESSIONAL searches of the Patent Office Records. Dependable. Reliable. \$6.00. For free protection forms write Inventions On Demand, 412 Albee Building, Washington 5, D.C.

WE have the markets if you have the ideas. Harvey Engineering Consultants, Cambridge 1, Maryland.

INVENTORS! Complete Service. Cash-Royalties. Patented. Inventions Researched. Patent Development Engineering. Free Invention Certificate. George Spector, Licensed Invention Engineer, 3615 Woolworth Building, New York 7.

INVENTORS! Determine patentability of your invention. Searches of the Patent Office Records administered professionally - \$6.00. For free invention protection forms write Inventions On Demand, Washington Patent Office Search Bureau, 1426 G St., N.W., Washington 5, D.C.

INVENTIONS Needed immediately for manufacturers. For additional information write Kessler Corporation, C-88-F1, Fremont, Ohio.

PATENT Searches \$6.00, complete. Inventors, attorneys, manufacturers use my original "World-Wide" Airmail service. Free Invention Protection form and "Information" booklet. Write: Miss Jean Haywood, 1029 Vermont Ave., N.W., Washington 5, D.C.

INVENTORS - Get the best offer first! Patented or unpatented. Write Carl Sommer, Director, Invention Protection Sales, 3136-D Sylvania Ave., Toledo 13, Ohio.

INVENTORS! Our Patent Search Department administers searches expertly. \$6.00. For dependable service, free invention protection forms, write - United States Invention Brokerage, 78a Wall Street, New York 5, N.Y.

"CASH in" your invention. Avoid mistakes. What you should know and do about protection. Send 25¢ coin for "The Inventor's Guide." Satisfaction guaranteed. Inventors Guidance Service, Box 451-C, Calimesa, California.

NOW Basic Patent Information \$1.00. Brooks, 1436 19th St., Terrace, Lawrence 2, Kansas.

DO NOT pay high fees! Obtain U.S. Patent yourself. It's easy with "Professional Kit with Fill-In forms" Free "Registration Form." Patent Protection Institute, 2000 P Street, N.W., Washington 5, D.C.

INVENTIONS Wanted for immediate promotion! Patented: unpatented. Outright cash or royalties! Casco, 308R Medical Science Building, Washington 5, D.C.

SELL your invention! Profitably Reports, (534-80), 145 West 45th, New York 25, New York.

BROCHURES, Circulars, Labels, Instructions, Data/spec sheets designed, printed. Glaser, Box 2950, New York City 16, New York.

FINANCIAL Agreement Forms: tell you how to market your idea. Polo of three for \$1.00. Science and Mechanics, 450 E. Ohio St., Chicago 11.

FOR THE HOME

JET Turbine Raindrop Garden Hose Nozzle, Dollar Returnable. Swan Company, 858-G, Coronado, Calif.

FORMULAS & TRADE SECRETS

FORMULAS - All Kinds - Money-makers. Three Catalogs, Dime. Kemikon, Park Ridge, Ill.

MODERN Manufacturing Formulas List Free. Moon Chemical, Marlville 1, N.Y.

ANY Product \$3.00. Catalog manufacturing Treatise 10¢. J. Belfort, 132 N. Clark, Chicago 1.

LARGE Formula Catalog 10¢. Big surprise. Western Chemical, Salem, Oregon.

MAKE Money making modern specialties from chemist-perfected formulas. Valuable literature free. Miller, Chemist, 1917-A, Tampa, Fla.

SECRETS revealed. Modern electronics divulged! Stillwater, Box 397-T, Morris Plains, New Jersey.

FROG RAISING

FROG, Crayfish Raising. Profitable Information 10¢. Vol Baishears, Berryville, Arkansas.

FUR BEARING ANIMALS

MINX - Complete Information free. Luke Superior Mink Farm, Superior E23, Wis.

GEMS, MINERALS, ROCKS & LAPIDARY EQUIPMENT

ROCKS and Minerals (a magazine for collectors). If you collect rocks, minerals, crystals, ores, gems, sands, pebbles—Rocks and Minerals is Your magazine. Founded 1926. Issued once every 2 months—112 pages per issue. \$3.00 a year, sample copy 50¢. Rocks and Minerals, Dept. SM, Box 28, Peekskill, N. Y.

PROFESSIONALS—Hobbyist 1960 catalog, Lapidary supplies, jewelry findings, Tools, Silver Supplies, Synthetics, Cut Gems, Jewelry mounting, Books, Gems, Minerals, Books. Send \$1.00 for catalog. Refunded first \$1.00 order. Technicraft Corp., 3550 Broadway, New York 31, N. Y.

GEMS & Minerals Magazine, "largest rock hobby monthly. Field trips, 'how' articles, pictures, ads, \$3.00 year. Sample 25¢. Box 857-B, Mentone, California.

EARTH Science, Rocks/minerals National Magazine. Subscription \$2.50. Sample 35¢. Box 857-SM, Chicago 90, Ill.

ROCKHOUSES—Gem Cutters—Jewelry Makers—new Free catalog—just off the press! Biggest supplier to hobbyists and craftsmen offering you tools, materials, equipment, introductory business and know-how. Free Catalog. Write Grieger's, Dept. C-8, 1633 E. Walnut, Pasadena, California.

ROCKS' Gems and Minerals, Finest quality. Price list—dime. 3730-S E. Waymire, Milwaukie 22, Oregon.

HELP WANTED

JOB on steamships and yachts, traveling foreign countries, Davenport's, 1354-L GPO, New York 1, N. Y.

AMERICAN—Overseas Jobs. Higher Pay. Transportation Paid. Men-Women. All Levels! Free Information. Business Headquarters, 79 Wall Street, Dept. K-3, New York 5.

BOOMING California Latest Job, Business opportunities, Housing Information, Sample \$1.00. Lynne, JSM, 17620 Valerio, Van Nuys, Calif.

HI-FI EQUIPMENT

RECORDERS, Components, Free Wholesale Catalogue, Carson, 125-M East 88, New York City 28.

HOBBIES & COLLECTIONS

AMAZING Introductory offer: 10 different foreign military emblems, only \$1.50; 30 different countries, special \$3.75. Foreign medal catalog 25¢; American catalog 25¢. Hobbies, Box 71-C, Rockaway 34, New York.

HOME MOVIES

MOVIE film: Free catalog! ESO-A, 47th Holly, Kansas City 13, Mo.

FREE every month—Blackhawk's newspaper-size catalog 6mm., 16mm. movies, 2"x2" color slides. Biggest selection in U.S.A. Bargains in used 16mm. sound films, projectors. Blackhawk Films, Davenport 22, Iowa.

HOME WORKSHOP SUPPLIES

LEARN Jewelry Making at home. Inexpensive Art Metalcraft course teaches how to make all types cut links, earrings, tableware, etc. of silver, gold, copper. Send postcard for free booklet. Interstate Training Service, Dept. L-5, Portland 12, Oregon.

101 PATTERNS of smart Gifts. Novelties, Shelves, Action windmills, Plus "Make Money Jig Sawing" \$1.00. Mastercraft, 638, 79th Street, Chicago 31.

FREE New plans catalog! Model 2400 things. Fun. Profit. Craftplans, 132-C Wabash, Chicago 5.

62 LAWN and Novelty Patterns \$1.10. Man. Sewing, Woman Washing, Bird Houses. 764, Strother, Bellington, W. Va.

HYPNOTISM

FREE illustrated hypnotism. Self-hypnosis Catalog. Write: Hypnotists, 8721 Sunset, Hollywood 46SM, Calif.

HYPNOTIZE Self, Others while asleep with amazing hypnotic phonograph records, tapes. Catalog free. Research Association, Box 24-C, Olympia, Wash.

"HYPNOTIZE" . . . One word . . . One finger snap . . . on stage. Satisfaction—or refund. \$2.00. Hypnomaster, Box 9309-V4, Chicago 90.

XRAY Mind! Hypnotize, one glance. Guaranteed, \$3.00. Wainstaker, Box 10, Ottery, Cape, South Africa.

FREE Catalog! Hypnotism! Autocontrol! Books! Recordings! Drawer SM-2-687, Rudloe, New Mexico.

HYPNOTIZE Successfully! "One Word," "Instantaneous," Against Will Methods Exposed! Complete Illustrated Course, including Secret Nerve Pressure Techniques. Free catalog. Hypnotic-Aids, Desk CSM-7, 1133 Broadway, New York City 10.

HYPNOTIZE others in minutes with Hypno-Coin, see ad in front of magazine. Also—Self-Hypnosis Record, Hypnotic Machine, Free catalog. Hypnotic-Aids, Desk CSM-7, 1133 Broadway, New York City 10.

HYPNOTISM, Selfhypnosis. Guaranteed home study course, Diploma issued. Free brochure. School Hypnosis, 1352 Central Park West, New York 23, N. Y.

WORLD'S largest catalog free. Merlin Publishing Co., 1244 Lincoln Ave., San Jose, Calif.

HYPNOTIZE unnoticed, quickly, effortlessly or refund \$1.00. Rinlen, Box 244, Cedarburg, Wisconsin.

"HYPNOTISM Explained," 64 page book 15¢. Bookmaster, 1843 Harte, San Jose 3, Calif.

THE Truth About Hypnotism: A 34 page booklet containing facts all should know. Answering all questions commonly asked. Send only \$1.00 to Hypnotic Research Institute, 437 John Street, Bridgeport 3, Connecticut.

IMPORT-EXPORT

HAND Tooled Purse World's Lowest Price. Santuario's, Postal 17707, Mexico 2, D.F.

INDIAN RELICS, GOODS & CRAFTS

SELLING 100,000 Ancient Arrowheads, Tomahawks, Spearheads, etc. List free. Lear's, Glenwood, Arkansas.

INVENTIONS WANTED

INVENTIONS Wanted: "Patented"—"Patent Pending." 28 years experience Promoting Inventions. National Service Bureau, 3124 Meramec, St. Louis 18, Mo.

INVENTORS: Hundreds of manufacturers have requested our assistance in locating marketable new products. Complete Information Free. Institute of American Inventors, Dept. IC, 635-P St., N.W., Washington 4, D. C.

INVENTORS—Do you want to sell or license your invention on cash or royalty basis? Write Kessler Corporation, C-88-7, Fremont, Ohio.

INVENTIONS wanted. Patented; unpatented. Tremendous manufacturers lists. Global Marketing Service, 2420 77th, Oakland 5, Calif.

INVENTORS: Don't sell your invention, patented or unpatented, until you receive our offer. Write Universal Inventions, Box 288, Marion, Ohio.

INVENTIONS Wanted now by my manufacturer clients. Patented. Unpatented. Write Gilbert Adams, Dept. H-1, 80 Wall St., Financial District, New York City.

ARE you interested in offers from reliable manufacturers for your invention? Research, patented, unpatented. Write Engineering Consultants, Cambridge, Maryland.

INVENTORS: Consider our offer first before selling or licensing your invention on a cash or royalty basis. Patented. Unpatented. Inventions On Demand, 79 Wall Street, New York 5, N. Y.

INVENTORS—Get the best offer first! Patented or unpatented. Write Carl Sommer, Director, Industrial Invention Sales, 3136-D Sylvania Ave., Toledo 13, Ohio.

INVENTOR'S Complete Service. Cash-Royalties Sales Inventions Researched. Patent Development. Business Invention Certificate. George Spector, Licensed Invention Engineer, 3615 Woolworth Bldg., New York 7.

INVENTIONS Wanted for immediate promotion. Patented, unpatented. Outright cash or royalties! Casco, 309R Medical Science Building, Washington 5, D. C.

SELL Your Invention. Cash, Royalty? Write For Offer. Ketchum's Advertising, D-1058, Springfield, Ill.

INVENTORS! Outright cash sale or royalties for your Inventions. Patented. Unpatented. Constant demand from our client manufacturers. Write United States Invention Brokerage, 78 Wall Street, New York 5, N. Y.

INVENTORS' Complete Service, cash royalties, sales for inventions also Patent Development. Write—J. T. Invention Sales Co., 25 Fayette St., Brooklyn 6, New York.

COMPARE offers then deal with Inventors Guidance Service, Box 451-C, Calimesa, Calif.

JEWELERS FINDINGS & SUPPLIES

FREE catalog. Costume jewelry parts. Supplies. Reasonable prices. Fast service. Guaranteed quality. Unique merchandise. Folsom's, Box 12, Medford 30, Mass.

JOB OPPORTUNITIES

MERCHANT Marine Jobs. Top Wages, Travel. California Seafood. How To Join. Book \$2.00. Free Details S. Buettner, 68-86 Forest Ave., Brooklyn 27, N. Y.

LEATHERCRAFT

FREE "Do-It-Yourself" Leathercraft Catalog. Tandy Leather Company, Box 791-X35, Fort Worth, Texas.

FREE Leathercraft Catalog. Quality Kicks, Leathers, Tools. Handcrafters, Montrose, Calif.

MACHINERY, TOOLS & SUPPLIES

FREE Power Tool Catalog. Wholesale Prices. Robinson, 14-P Brooks Drive, Austin, Georgia.

SHEET Metal Brakes: 36", \$45.00; 49", 61". Bench Shears. Free catalog. Vykco Co., 4153 Jason, Denver 11, Colo.

MAGIC TRICKS, JOKER NOVELTIES & PUZZLES

WORLD'S finest professional magic. Joker novelties. Giant illustrated catalog 10¢. Top Hat, Evanston 15, Ill.

500 TRICKS, Famous Douglas 120 page catalog number 29 available for complete catalog—magic tricks—equipment just 10¢. World's fastest service. Magicland, Dept. 44, Box 274, Dallas, Texas.

BIG Fun Kit—Tricks, jokes, novelties, booklets. Real gaff stuff. Howls galore. \$2.00. Johnson, 514 McRae, Wilmington, North Carolina.

WORLD'S Greatest Catalog of Tricks. Jokes, Magic! Big 160 Page Edition! Over 1000 exciting items! Free trick given. Rush 25¢. House of 1000 Mysteries, Dept. SMC8, Trumbull, Conn.

3100 NOVELTIES, Jokes Tricks, Gadgets, Funmakers, Hobbies. Big catalog 10¢. Johnson-Smith, D-498, Detroit 7.

TELEPHON Telephone Trick Instructions 25¢. Shelly Publications, P. O. Box 201 Brightwaters, New York.

MAIL-ORDER OPPORTUNITIES

MORE than 100 Profitable Suggestions in each issue of Progressive Mailtrade. Quarter for current issue and Special Offer. Mailtrade, P.O. Box 357, Sheboygan, Wis.

MAIL Letters Featuring Real Merchandise! Get \$10.00 orders in Every mail—\$8.00 profit. Everything furnished. Write: The Mailerette, 1502 S. Lowell, Santa Ana, California.

DYNAMIC Mail Order Plans. Everything furnished. Information! 25¢. Donovan, 79-SC Greenbelt, Levittown, New York.

MAKE Mail Order pay. Get "How To Write a Classified Ad That Pays." This handbook tells how with examples. Includes certificate worth \$2.00 and classified ad in S & M. Send \$1.00 to Science and Mechanics, 450 E. Ohio St., Chicago 11.

MAILING LISTS

5,000 CIRCULARS printed Mailed \$12.95. Mailing lists \$5.00. 1,000. Write Dixie Mailers, Kings, N. C.

LIVE Name Available—Buyers Prospects! 120,000 Mail Order Books 15,000 Earthworm! F. Dickman Company, Willow Springs, Missouri.

5,000 DIFFERENT occupant address labels. \$4.98. P.O. 717C, Atlanta 1, Ga.

MISCELLANEOUS

HEARING AID batteries wholesale. List free. Write, Box 51, York, Pa.

ORNAMENTAL Iron Designs. Book of 1600 beautiful, practical designs for railings, columns, etc. Free literature. Cunningham, 3881 South 3200 West, SM-52, Salt Lake City 4, Utah.

"WINE&MAKING." Beer, Ale Brewing. Highest powered recipe. Illustrated. \$2.20. Eaton Bookstore, Box 1242-H, Santa Rosa, Calif.

"HOMEBREWED Beers, Wines"—High Powered. Instructions, formulas—\$1.00. Dean's, Box 40-534, Elberton, Georgia.

BABY NAMES: Beautiful new different. Only \$1.00. Maxwell, 405 Lexington Ave., Newark, Ohio.

"HOW To Pick Locks." Illustrated. \$9.95. Wilford Publications, Box 7400, Washington 4, D. C.

HOMEBREWED Beers and Malt Liquors. Formulas and instructions \$2.00. "How To Do It" Industries, 3406-B North Interstate, Portland 17, Oregon.

MISILES & ROCKETS

ROCKETEER'S Supplies, Chemicals. Catalog, plans 25¢. Central Rocket Co., Waupeca, Wis.

ROCKET Supplies: Nozzles, Cones, Tubes. Specials also made. Catalog 10¢. Sky Mig. Co., Mineral Point, Penna.

NEW Revised Edition "How To Make Rockets" \$1.00. Michael Callaghan, 705 E. 17th Ave., Denver 3, Colo.

MODELS & MODEL SUPPLIES

SHIP Models. Most complete line in New England. Kites, fittings, plans, books, tools, engines, motors. Illustrated catalog \$35. James Ellis & Co., Inc., Dept. C, 382 Atlantic Ave., Boston 4, Mass.

"POWER Drives Handbook"—36 pages illustrating many types motor drives for model autos, boats, displays, turntables, etc. Mail \$3 cents cash, returnable if not used \$3.00 or more. Wilson's of Cleveland, Dept. SM, P.O. Box 8995, Ft. Lauderdale, Fla.

MONEYMAKING OPPORTUNITIES

MAKE Money Clipping Newspapers. Write Newscraft, SMC-983-E, Main Columbus 6, Ohio.

MEN—Women! Start Money-Making Plastic Laminating Business at home in spare time! Material that costs 11¢ brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars. Free Ruler name or postcard. Wilson's of Cleveland, Dept. SM, P.O. Box 8995, Ft. Lauderdale, Fla.

MAKE \$25-\$50 Week, clipping newspaper items for publishers. Some clippings worth \$5.00 each. Particulars free. National, 81-J, Knickerbocker Station, New York.

MEN! Women! Earn extra cash! Address advertising mailers. Langdons, Box 41107-SM, Los Angeles 41, Calif.

BECOME Independent with your own franchise business. Thousands earning handsome incomes. Request interesting facts today. National Franchise Reports, CP-528, 333 North Michigan, Chicago 1.

CO-PUBLISHED "Home Business Digest" (World's Oldest, Mail Order and Home Business Magazine, established 1899). Send \$1.00 for 2 issues and instructions, or write for free details. GPO Box 972-SM, New York 1.

YOUR Own, Easy-To-Start, Home Mail Order Business. Spare time. Fascinating, profitable! Information free. Alfano, 19-SM Pine, Closter, New Jersey.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Quar, brings sample ad space offer. Mailtrade, P.O. Box 397, Sheboygan, Wis.

START Big-Pay Business at Home in spare time. No experience needed to operate little table-top machine for producing baby shoes. Make \$5.00 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room CM-6-J, Chicago 26, Ill.

WORK at home. No selling or investing. John Paul, 704 Walnut, Dept. 2, Scottsdale, Penna.

\$15.00 THOUSAND addressing envelopes, cards, home-longhand, typewriter. Particulars free. T. Economy, Box 2580, Greensboro, North Carolina.

EASY To start rubber stamp business at home in spare time. Make up to \$9.80 an hour without experience. Facts free. Write to Roberts, 1512 Jarvis, Room CR-5-J, Chicago 26.

\$1,000-\$10,000 YEARLY Possible, raising Fish Worms! Full, sparetime, backyard, garage, basement, spare room. Sell worms crop to us! Send name to: Red Wigglers, Warsaw 10, Indiana.

FREE "Do-It-Yourself" Leathercraft Catalog. Tandy Leather Company, Box 791-W31, Fort Worth, Texas.

100% PROFIT. No investment. Stamp business. Details. Miller's, Box 584, Brooklyn 1, N. Y.

MAKE \$1,000 Extra This Year! Over 800 best-selling items! Gifts for men, women, children, the home! Distinctive greeting cards, stationery, jewelry, cosmetics, mechanical gadgets, novelties, household helps, toys, games. No minimum order. Samples on approval. Make up to 92% profit! Write for free catalog. Greetings Unlimited, 6-215 Park Square, St. Paul 1, Minn.

PLATE baby shoes. Make jewelry, novelties. Start with \$3.00 refundable investment. Free catalog. J.C.A., 488-B Northwest 73rd St., Miami 50, Fla.

OPERATE Home Mail-Order Business. Free Facts. Van, 177 Saturn, San Francisco 18, Calif.

SPARETIME Homework! Guaranteed Pay! No Selling! Elves, 5565M Beacon, Manchester, N. H.

START planning for your security tomorrow. Send 75¢ for Income Opportunity Book. No. 650, to Science and Mechanics Magazine, 450 East Ohio St., Chicago 11, Ill.

"MOTION PICTURE PROJECTORS, FILMS, SLIDES, & SUPPLIES"

5,000 8mm.-16mm. Silent-Sound Films. Discounts. International-O, Greenville, Long Island, N. Y.

10¢ BRINGS Big New Cine Manual for the 8mm-16mm Movie Maker. Have 45¢ on first test and color movie film, all Home Processing Equipment. Superior, 442-50 N. Wells, Chicago 10.

MOTORCYCLES, MOTORSCOOTERS, BICYCLES & SUPPLIES

HOP-Up Guide tells how to modify motorcycles and motorscooters for more acceleration, power, speed \$1.00. Advance Engineering, Box 225, Dallas 21, Texas.

HARLEY Davidson's—Used Bargains. Bulletin 25¢. Knuth's (Factory Dealer), 2451 Fond du Lac, Milwaukee 8, Wis.

RECONDITIONED Motorcycle Motors. Chrome accessories. Complete stock Indian parts. Expert rebuilding. Fast Service Indian Motorcycle Sales, Kansas City 21, Missouri.

100% MOTORCYCLE, Motorbike, Bicycle Bargains. Parts, Accessories. Bargain Catalog 35¢. Bunlico, 148-SM Covington, Virginia.

BMW Motorcycles, shaftdrive. U.S. Distributor—Butler & Smith, Inc., 160 West 83 St., New York 24, N. Y.

MUSIC & MUSICAL INSTRUMENTS

SONG Poems and lyrics wanted. Mail to: Tin Pan Alley, Inc., 1650 Broadway, New York 1, N. Y.

POEMS Wanted immediately for Musical Setting and Recording. Free Examination. Rush Poems. Songcrafters, Acklen Station, Nashville, Tenn.

SONGWRITERS, with publisher contacts. Send song ideas. Share royalties. No fees. Send poems: Songwriters' Associates, 1650 Broadway, New York 19-H.

ORGAN \$49.00, Melodica \$15.00. Zither \$14.95 and Mart, 3461 Oakland, St. Louis 15, Mo.

SONGWRITERS! A Publishing House For Amateurs. Songs Published, Recorded, Free. Music Free, Lyric Course. Amateur Songwriters Association, 1356 Hancock Street, Quincy, Mass.

FOR SALE: Stradivarius Violin. Mrs. Carl Pukiser, Route 2, Ludington, Mich.

OF INTEREST TO WOMEN

MAKE \$25 to \$35 weekly addressing envelopes. Free instructions reveal how. Glenway, Box 6358, Cleveland 1, Ohio.

LADIES: Earn up to \$200 hour sewing babywear! No house selling! Send postcard to Cuties, Warsaw 17, Indiana.

OFFICE EQUIPMENT & SUPPLIES

RECONDITIONED And New Office Machines. Supplies, Typewriters, Adders, Duplicating, printing, addressing machines \$20.00 up. Dixie Graph, King, North Carolina.

OLD GOLD WANTED

HIGHEST Cash For Old Gold, Jewelry, Gold Teeth, Watches, Diamonds, Silverware, Spectacles, Platinum, Mercury. Free information. Rose Refiners, Heyworth Bldg., Chicago 2.

OPTICAL GOODS

"FREE" Catalogue! Thousands war surplus optical bargains. Lenses, Prisms, Telescopes, Binoculars. Send \$1.00 for 10 lens Hobbyist Set and Project booklet. J. Jaegers, 691 West Merrick Road, Lynbrook, N. Y.

WAR Surplus Bargains! Millions of lenses, instruments, telescopes, binoculars, components and complete line of astronomical telescope items. World's greatest optical surplus store. Catalog only \$1.00 for beginner's 10-lens kit and big instruction booklet Stock 3-CG. Write for catalog CG Free! Edmund Scientific Co., Barrington, New Jersey.

BINOCULARS, Telescopes, Microscopes. Terrific Values. \$3.98 up. Request free money-saving catalog. Criterion, Dept. CM-45, Hartford 1, Conn.

TELESCOPE kits direct from manufacturer. Other optical hobby kits. Large selection. Free booklet. Esco Products, Oakridge, N. J.

BUILD your own Reflector Telescopes, complete kit! Mirrors, Eyepieces, Tripods, all other accessories. Request free illustrated catalog. Esco Products, Esco Manufacturing, Dept. KSM-44, Hartford 1, Conn.

REFLECTING Telescopes, 60X completely assembled. Guaranteed observatory clearness. Free Brochure. The Skyscope Co., Inc., P.O. Box 55, Brooklyn 28, N. Y.

DYSCOPE—Amazing world famous reflector telescope. Request free Brochure. Criterion, Dept. DSM-51, Hartford 1, Connecticut.

TELESCOPES, Binoculars, Microscopes—all sizes. Complete telescope makers supplies. Free illustrated catalog. Suffolk Science, Mattituck, New York.

BINOCULARS, Telescopes, Microscopes. Free Catalog. National Optical Company, Dept. SM, 303 New York Ave., Union City, New Jersey.

FREE booklet plus discount catalog. Microscopes, Telescopes, Binoculars, Craig's, 2705 Meadowview, Columbus 3, Georgia.

PATENT SERVICE

INVENTORS: Test the Commercial value of your patented or unpatented inventions. Quick and inexpensively. Write for free information. Institute of American Inventors, Dept. 1A, 635-F St., N.W., Washington 4, D. C.

PATENT Searches, including copies of most patents, \$6.00. Reports airmailed within 48 hours. More than 200 registered patent attorneys have used my service. Free invention protection forms. Write Miss Ann Hastings, P.O. Box 176, Washington, D. C.

PATENT Searches \$6.00, 48-hour service. Free invention protection forms. Write Raymond L. Smith, Patent Searcher, 620 Sheraton Building, Washington 5, D. C.

PATENT Searches \$6.00, 48-hour airmail service. Invention protection forms. Free. Write Patent Engineering Service, 711 14th Street, N.W., Washington 5, D. C.

INVENTORS' Complete Service. Cash-Royalties Sales. Inventions Researched. Patent Development Engineers. Free Invention Certificate. George Spector, Licensed Invention Engineer, 3615 Woolworth Building, New York 7.

PATENT Searches \$6.00 complete. Inventors, attorneys, manufacturers use my original "World-Wide" Airmail service. Free protection of your invention and information Every Inventor Needs. Miss Jean Haywood, 1029 Vermont Ave., N.W., Washington 5, D. C.

INVENTIONS Wanted by 140 manufacturers. Do you have an idea for a new product or a way to improve an old product already in use? Send your name and address for free details to Science and Mechanics Magazine, 450 E. Ohio St., Chicago 11, Ill.

PERSONAL

BORROW \$100 to \$800 By Mail. Quick. Easy. Private. No Co-Signers. Repay in 24 small monthly payments. For the amount you want write today to Dial Finance Co., 410 Kilpatrick Bldg., Dept. H-1, Omaha 2, Neb.

ADULTS! Unusual Books. Catalog 25c. Diana, 552 San Jose, San Francisco 10.

DON'T know where to find it? We do. 594 Information Center, Box 237, Muskegon Heights, Mich.

BORROW By Mail. \$100-\$800. Anywhere. Air Mail Service. Postal Finance, 290 Keeline Building, Dept. 18, Omaha 2, Nebraska.

MEXICAN Legal Matters. A. Espejo S., Box 317, Tijuana, Mexico.

POSITIVE Popularity! Simplified Plan. \$1.00. Shelly Publications, P. O. Box 201, Brightwaters, New York.

PETS—DOGS, BIRDS, RABBITS, HAMSTERS, ETC.

RAISE Chinchillas for us. Free catalog. Keeney Brothers, New Freedom 11, Pa.

RAISE Angora, New Zealand Rabbits on \$500/month plan. Plenty markets. Free details. White's Rabbitry, Mt. Vernon, Ohio.

RABBITS—Best, most profitable varieties. Catalog free. Grinsteads, Edwardsville, Ill.

PETS every description shop anywhere catalog \$1.00 (Refundable) Jungeland, Florida, Alabama.

PHONOGRAPH RECORDS

PARTY Records. Sample Record And Catalog \$1.00 Postpaid. Hollywood Jokers, Dept. 8, P.O. Box 1886, Hollywood 28, California.

PLASTICS & PLASTIC PRODUCTS

NEW! Plastic Vacuum-Forming Machine. Hobby. Easy. Profitable. R. Burr, 330 East Center, Kalamazoo, Mich.

New Liquid Casting Plastic, clear, colors. Embed real flowers, butterflies, photos, coins. Send 25¢ for two handbooks. "How to Cast Liquid Plastics" and "How to Make Extra Money at Home." Castolite, Dept. J-103, Woodstock, Ill.

PRINTING, MICROGRAPHING & MULTIGRAPHING

1,000 BUSINESS Cards. "Raised Letters" \$3.95. Samples. Pioneer SM-8, Island Park, New York.

MIMEOGRAPHING 100-8½x11 Type-written Sides—One \$1.95. Two \$2.95. Swanson, 433 Clover Dock Road, Clover, New Jersey.

1,000 BUSINESS Cards. "Raised Letters" \$3.95 Postpaid. Free Samples. John H. Taylor, R.D. 2, Box 215, West Middlesex, Pennsylvania.

JOB Printing—Letterheads—Envelopes—Circulars. Printing, 21-S Barclay, Portsmouth, Va.

PRINTING Office Supplies Wholesale. 10,000 items. Save 50%. Literature free. Shleifer, 31 Leigh Place, Irvington 11, New Jersey.

COLORED Or White 8½x11 Offset 86.50-1000. \$18-5000. Pastel Glasser, Box 2850, New York City 17.

100-WORD 3"x9" Circulars, 5000, \$10.00. Acemprint, R-2, Landrum, South Carolina.

PRINTING OUTFITS & SUPPLIES

DO your own Printing. Save money. Simple rules. We supply everything. Print for other good profit. Raised printing like engraving too. Have home shop. Details free. Kelsey Presses, V-2, Meriden, Conn.

PRINTING Presses, Type, Supplies. Lital 44, Turnbaugh Service, Mechanicsburg, Penna.

MAKE Your Own self-molding rubber stamps and printing cuts. Plexirubber, Argyle 10, Wisconsin.

RUBBER Stamp Presses, Supplies. Kleck, 2025 Barney Road, Kalamazoo, Michigan.

PRINT without expensive equipment. Particulars free. Rapid Printing Service, Edwardsville, Ill.

RUBBER Stamp Making Machines. Supplies. Helms Stamp Co., Bristol, Tenn.

PROFITABLE OCCUPATIONS

JOB: High pay. Foreign countries. USA. All trades. Write Dept. 55F, National Employment Information, 1020 Broad, Newark, N. J.

FREE Book "890 Successful, Little-Known Businesses." Work home! Plymouth-23X, Brooklyn 4, N. Y.

RADIO & TELEVISION

10 DISTANCE Crystal set plans—25¢; 20 different 50¢, with Transistor experiments, catalog. Laboratories, 1131-M Valencia, Los Angeles 10, Calif.

GOVERNMENT Surplus Radios, Transmitters, Mine Detectors, Sniperscopes, Parabolic Reflectors. Picture catalog 10¢. Meschna, Malden 48, Mass.

RADIO & TV Tubes at Manufacturer's prices! 100% Guaranteed! Brand New! No rebrands or pulls! United Radio, Box 1000-1, Newark, N. J.

FIX Your Own TV, Save 80%! Send for Free Illustrated Chart showing how! We'll include Giant Electronics Catalog. Zelytron, 220-N West 42nd Street, New York City.

TELEVISION—Radio Tubes, 59¢-Year Guarantee. Evergreen Electronics, P.O. Box 36, Everett, Wash.

RECORDERS, SOUND EQUIPMENT & SUPPLIES

TAPE Recorders. Hi-Fi Components. Sleep Learning Equipment, tapes. Unusual values. Free Catalog. Dresser, 6902-S 174 St., Flushing 65, N. Y.

REMAILING SERVICE

"RELIABLE" remailing 25¢. Receiving—forwarding \$3 monthly. Guaranteed, 1417 48th Ave., Oakland 1, Calif.

NO remailing charge—just three dollars monthly. Bensons, 153 W. 42nd, New York 36.

OIL capitol remails 25¢. Monthly \$4.00. Coker, 1345 S. Darlington, Tulsa 40, Okla.

CONFIDENTIAL Remailing, Letters 25¢. Lee's, P. O. Box 6142, Charleston, West Virginia.

REMAILS 25¢. Monthly rates. Complete details free. Sunset, Box 45-M, Hutchinson, Minn.

CONFIDENTIAL New York Mailing. Receiving forwarding address \$3.00 monthly. Remails 25¢. Birnhan, 109 West 42, New York 35, N. Y.

YORK VEGAS Nevada—Entertainment, Movie Stars, Divorces. Free post cards. Remailing 25¢. Interstate, Dept. SM, Box F, Rossmore, Calif.

SECRET Mail Address. \$3.00 monthly. Hedreth, Box 840-S, Alhambra, Calif.

TUCSON Remails 25¢. Receiving Forwarding \$3.00 Monthly. Dunn, 5644 E. Pima, Tucson, Arizona.

SAN ANTONIO Remails 25¢. Confidential, prompt, dependable. Monthly \$3.00 postpaid. Patrick, Box 11447, San Antonio 6, Texas.

LETTERS remailed 35¢ 1 airmail Canadian air stamp. Ross Hancock, 83 Bellhaven Road, Toronto 8, Canada.

SAN DIEGO—West Coast Forwarding Agency. Prompt—Efficient—Confidential. Remail Service. Monthly Rates. 25¢ Letter—5 for \$1.00. Box 408, San Diego, California.

SECRET. Confidential. Prompt. Remailing Forwarding 25¢. Monthly Rates \$3.00. Antelone, 1210 E. 17th St., New York 53, New York.

RUBBER STAMPS

3 LINES, Rubber Stamp \$1.00. 25 cents each additional line. Whitney's Rubber Stamp Shop, 18-S Washington Ave., Chatham, New York.

FREE—Rubber Stamp Catalog. Martin, 1425-B Major Drive, Jefferson City, Missouri.

THREE Line Name Address \$1.00. Catalog Free. Mayer, Rich Hill, Missouri.

POCKET stamp 75¢. Other guaranteed bargains. Arthur Johnson, 600 N. Cicero, Chicago 44.

SALESMEN WANTED

IF you're interested in making money in selling, see the hundreds of exceptional opportunities in Salesmen's Opportunity Magazine. Send name for your copy absolutely free. Tell us what you're selling now. Opportunity, 848 North Dearborn, Dept. 20, Chicago 10, Ill.

MAKE Extra Money selling advertising matchbooks. Free catalog and sales outfit. Matchcorp., Dept. SM-80, Chicago 32.

MAKE Extra Money—Big Cash Commissions plus premiums for you and your customers. Sell Advertising Book Matches—sensational new Tenorams, Glamour Girls, Hillbillies; dozens others. All Sizes—Quick daily sales; big repeat business. Free Master Kit and selling easy—no experience necessary. Superior Match, Dept. V860, 7530 Greenwood, Chicago 19, Ill.

BIG money making opportunity soliciting delinquent accounts. Top commissions. General Finance, 304F Pickwick Bldg., Kansas City 6, Mo.

SHINE Shoes Without "Polish." New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristie 49, Akron, Ohio.

MAKE Up to \$147.50 Daily with simple 30-second demonstration sensational new Voice-caster. Free both hands, permits work while phoning, hold 2-way phone talk and receive calls. Transistorized, no installation. Offices, stores, factories order 1 to 6; housewives order fast. Make \$14.75 and more each. Ten sales daily possible spare or full time. Free money-making plans free. Write Voicecaster Div., Merrile, 114 E. 32nd St., Dept. A-68R, New York 16.

MONEY-Making Opportunity! Take big profit orders for world famous Patented Varieties of Fruit Treasures Also Flowering Shrubs, Roses, Vines. Big Sales outfit free. Stark Bros., Desk 30181, Louisiana, Missouri.

SCIENCE EXPERIMENTS

ELECTROSTATIC Generators 200,000 V. Kit \$24.50 postpaid; 500,000 V. Kit over 3 feet tall \$32.50 postpaid; other models to \$1,000 V. Vacuum equipment: Mechanical pumps \$24.50; Discharge pumps \$18.00; McLeod gauges \$14.00. Write for free catalog. Morris & L.C., 294 Elm, Buffalo 3, N. Y., Dept. S.M.

SONGWRITERS

POEMS Wanted for musical setting and recording. Send poems. Free examination. Crown Music Company, 49-R West 32, New York 1.

SONGWRITERS: Recording company wants new songs. Royalty basis. National sales promotion if selected. No charge for melodies. Send material. Music Masters, Dept. H-34, 8344 Melrose, Hollywood, California.

SONG Poems and lyrics wanted. Mail to: Tin Pan Alley, Inc., 1650 Broadway, New York 19, N. Y.

SPECIAL SERVICES

UNIVERSAL Travel Information. Clayton Mampa, Dept. SM810, 555 Surf, Chicago 14.

STAMP COLLECTING

100 OLD United States between 1851 and 1935, \$1.00. Roush Stamps, 61 Chestnut, Sandusky, Ohio.

225 STAMPS for only 10¢. This mammoth value includes Airmails. Pictorials: stamps from strange Countries cataloguing up to 25¢ each! Also approvals. Mystic Stamp Co., New York 1.

TERRIFIC Stamp Bargain! Israel-Iceland-Vatican Assortment, plus exotic triangle set. Also fabulous British Colonial Accumulation—plus large stamp book—all four offers for 10¢ to send us what you want. Empire Stamp Corp., Dept. SM, Toronto, Canada.

OLD scarce U. S. seconds on approval. Slight imperfections, lowest prices. Herfeld's, Clintonville 13A, Newark 8, N. J.

123 DIFFERENT colorful stamps 10¢. Bargain approvals. Krehl, 1708 Nebraska, Orlando, Florida.

508 DIFFERENT World-wide from Morocco, Morocco, Indonesia, etc. cataloguing over 95,000 stamps. Offer only Adults only. Approvals. Littleton Stamp Company, Littleton 30, New Hampshire.

ALBUM: Hundreds of Spaces! Only 10¢. Postpaid! Stampmart, Hartford 1, Conn.

HALF Penny Up World Approvals. Nureit, Box 444, Los Angeles 4, Calif.

UNITED STATES commemorative collection containing 33 different—10¢. Approvals. White, 516-X Avenue L, Brooklyn 39, N. Y.

14,000 DIFFERENT! Amazing new plan builds your collection systematically, country by country. Only 50¢ weekly. Free details. L. G. Ware, Westport 20, Conn.

100 DIFFERENT Spain 25¢. Penny approvals included. Reed, Box 980, Chicago 90, Illinois.

68 DIFFERENT. Old United States, Pictorials, Topicals, Triangles, Etc. 5¢. Worldwide Approvals, Tel-Arta, Milford, Connecticut.

FIVE Spanish Bullfighters, Only 10¢. Approvals. Premiums. Faith, 1225 Campbell, Alhambra, Calif.

LUXEMBURG, 100 Different, \$2.00 with approvals. Jacobson, Champaign, Ill.

1000 DIFFERENT Worldwide Stamps \$1.00. Valued over \$20.00. Universal, Box 6, Kenosha 9, Wis.

FREE! \$1.00 worth your choice, from first selection. No strings! Adults only. Please, Request now. Philadelphia, Dept. KP, New Falls, New York.

ROOSEVELT Diamond. Pope Triangles, Greenland, Angola, 51 others. 5¢. Approvals. Longhorn, Box 3088-B, Lubbock, Texas.

10 U. S. OVER 50 Years Old 10¢. Robert Gallup, Albany 1, N. Y.

FREE! Unusual "Animals" packet. Reusable approvals. Dancer, B75-814, Mansfield, Ohio.

POLYNESIA girl, Ryukyu lion, Chiang birthday, Czech mushrooms, Israel musicians, Ghana Nkrumah, only 10¢. Albums, Catalogs, many others free for approval buyers. Bell Stamp Service, 5345, Bell, California.

GODS OF Ancient Greece: Crostian Legion; U.S. National Parks; Egyptian Gods; New Issues; Others Free When Purchasing. Approvals. Stamp Farm, At-11, Oxford, Wis.

U. S. Stamps. Giant Discount Catalog—20¢. Raymak, 37-VK, Maldenlane, New York City 38.

ILLUSTRATED U.S. Catalogue 20¢. Returnable. Philpot, 1902 Losey, LaCrosse, Wisconsin.

300 STAMPS 30¢ No Approvals. Mike, 563 San Jose, San Francisco 10.

100 DIFFERENT U.S.A.—50¢. Approvals. Uechter, 1143 North Keeler, Chicago 51.

OLD album collections, 1st 4¢ stamp. Wokasien, Arlonia Trailer Court, Hamburg, New York.

TWO \$3.00 United States Stamps. Twenty others 10¢ with United States approvals. Irwin, Box 1115, Brooklyn 30.

21,000 ALL different stamps, yours for only pennies a day on our systematic purchase plan. Details free. O. W. Siskel, 1435 Cherrydale, San Jose 23, Calif.

FREE! Triangles, Pictorials, others. 5¢. Different, colorful, unusual approvals. L. Baird, Box 8113, Portland 7, Ore.

100 DIFFERENT 10¢ with approvals. Smith, 508SM Brooks, College Station, Texas.

GENUINE India "Court Tax" Stamps Free with Approvals. Wm. Rice, 87 Washington Ave., Kingston 4, N. Y.

SURPRISE Packet 10¢ With Approvals. Monson, 4524 Montview, Denver 7, Colo.

200 MIXED U. S. Including Large Commemoratives, Dime, Monjar, Cincinnati 14, Ohio.

Free one half pound of United States Mixture with approvals. Send 20¢ for postage. Wm. Rice, 87 Washington Ave., Kingston 4, N. Y.

300 WORLDWIDE for 25¢! U. S. Presidential, Commemoratives. First U. N. Olympics, Space Satellite, Russia—hundreds more! Approvals, illustrated offers included. Wozniak, 1329, Winston-Salem, North Carolina.

COUNTRY collections on approval. Sherman, 6728 N. Tallman, Chicago 45, Illinois.

No approvals. Amazing collection 132 colorful recent issues—\$1.00. Continental, Box 1553, Washington 13, D. C.

FREE! Giant Roosevelt Diamond, 23 others. Approvals. Myers, 17592 Ardmore Detroit 35, Mich.

TRADE your duplicates toward our approvals! (Foreign only.) Complete information 10¢. Variety Stamps, Box 98-M, Newton Highlands 81, Mass.

100 DIFFERENT World wide 10¢ with approvals. Dunning, 1634 Chipendale, Houston 18, Texas.

BERLIN Bears free with selection. Heilmueller, Box 323, Asbury Park, New Jersey.

START YOUR OWN BUSINESS

LEARN Real Estate by listening to records. Lee Institute, Brookline 46, Mass.

REFINISH Furniture, Make Colors, Etc. Professional Instructions Two Dollars. Donovan, 6300 Chase, Dearborn, Mich.

40 WAYS to Help Yourself—by setting up your own business—described in income opportunities. Send 75¢ for a copy to Science and Mechanics, 450 E. Ohio St., Chicago 11.

SURPLUS EQUIPMENT

JEeps—\$223.00, Trucks—\$212.00, Tractors—\$68.00, Tools, Guns. Typical Government Surplus Prices. Buy Direct. List Of Depots, Procedure, Full Details Only \$1.00. New York Enterprises, Wall Street Box 402-B3, New York 5.

SURPLUS Sales how and where to buy in your area. Complete information and instructions send \$1.00 to: Surplus Information, Headquarters Building, Washington 6, D. C.

GOVERNMENT Surplus—Anyone can buy direct. Weekly lists tell where, when and what is being sold, how to buy. \$7.00 Quarterly, \$25.00 year, or send 50¢ for latest issue. Government Surplus Sales, P.O. Box 9602SM, Washington 9, D. C.

SWAP FOR FUN OR PROFIT

READ, "Trading Post Magazine," 10¢. Thorner's, 525 Dewey, Jackson 16, Mich.

TATTOOING SUPPLIES

LEARN profitable, fascinating Tattooing. Illustrated information \$1. Zeis, 728-G Leslie, Rockford, Ill.

TRADE SCHOOLS

EARN While You Learn. Auto And Diesel Mechanics Master this top paying trade. Many graduates earn \$100 a week and up. Approved for Korean veterans. For free information write Dept. No. 258. Nashville Auto-Diesel College, Nashville 3, Tenn.

TREASURE FINDERS

TRANSISTOR Treasure Detectors, underwater detectors. Many models. Free catalog. Gardiner Electronics Co., Dept. 5, 2545 East Indian School, Phoenix, Ariz.

GOLD-Silver Detectors. Geiger Counters. Violites for tungsten, etc. Best available. Guaranteed. Information Free. Detector, Dept. T-H, Sylmar, Calif.

\$25.00 INFORMATIVE Folder. "Metal Locating Kinks." 25¢. IGWTM, Williamsburg, New Mexico.

DISCOVER buried loot, sunken treasure, gold, silver, coins, battlefields and ghost town relics with powerful transistorized locators pioneered and perfected by Goldak. Low as \$79.50. Free, exciting information, literature on maps. The Goldak Corp., 1545 W. Glenoaks Blvd., Glendale 1, Calif.

SEARCHING For Treasure? Transistorized electronic M-Scope locates it. Lightweight. Guaranteed. From \$59.50, Easy Terms. Free Catalog. Schlager Research, Dept. C-3, Palo Alto, Calif.

UNIQUE inexpensive treasure locator. Free literature. Dowling Engineers, Lafayette, Alabama.

TELETYPE Map Handbook, 25¢. Locators. Howe, 811 Kansas, Atchison, Kansas.

WANTED TO BUY

QUICKSILVER, platinum, silver, gold. Ores analyzed. Mercury Company, Norwood, Mass.

WATCHES, WATCHMAKING & REPAIRING

WATCHMAKERS' Tools. Materials. Supplies. Watches, Catalog. Galen, Box 1000, Chicago 80, Ill.

WATCHMAKERS', Jewelers', Lapidaries' Catalogs, Benzale, 6910 Venice, Culver City, Calif.

NEW list free. Watchmaking books, tools, materials, lathes, watches. North American, Dept. SM-80, 2320 Milwaukee, Chicago 47.

WATCHMAKERS' Journal. Instructions on watch repairing. For watchmakers, learners, Hobbyists, Collectors. Sample copy 25¢. Dean Co., Box 3218-C, Daytona Beach, Fla.

WEATHER INSTRUMENTS

BAROMETERS, thermometers, hygrometers, wind vane, anemometers, rain gauges, forecasting aids—amateur and Weather Bureau types—send for free catalog—Science Associates, 194 Nassau St., Princeton 11, New Jersey.

WELDING EQUIPMENT & SUPPLIES

WELDERS, 110/220, 130 Amps. \$39.50. Morris, 1070-N Inner Drive, Schenectady, New York.

ACETYLENE Welding outfits—Arcwelders. Dealership open. Eagle Welding, Dept. SM, 5085 Broadway, Chicago 40, Ill.

FREE Catalog, welders, welder kits. Build 200-ampere welder, 100-ampere generator, plans 25¢. Dunbar Manufacturing, 2916 Pillsbury, Minneapolis 8, Minn.

BUILD or buy efficient inexpensive 250 ampere welder. Guaranteed plans 25¢. Free welder kit catalog. LeMay Manufacturing, Minneapolis, Minn.

BUILD AND FLY THE ESSEX HELICOPTER

"Build-It Yourself." Very Low Cost Design, Glider or Motor Type 'copter—Simple To Construct. Easy To Fly. Also with Piston Engine. No Pilots License Necessary. Build and Fly in a Few Weeks! These Are Real Detailed Plans. Not Simple Design Drawings. You Get Your Money's Worth With Us. Order 14 Fuselage Plans, Specs., Kit Prices Today!

ESSEX AIRCRAFT CO., P. O. BOX 151 • DEPT. SM-7 WINDSOR, ONT., CANADA



BUILD MUSCLES & HEALTH \$1 post paid with BODY BUILDER ONLY

This new Chest Pull Body Builder develops powerful 'he-man' muscles. A-S-T. Ideal for the beginner to give him a real start in championship muscularity and perfect for the more advanced body builder to combine with his regular training for extra size and strength. Body Builder is wonderful for developing massive arms, shoulders, chest and back. Write for free Muscle Building Catalogue. ONLY \$1 POSTPAID, NO C.O.D.

MEYFORD PRODUCTS, INC., Dept. 152F, Box 39, Bethpage, New York

S&M IS MONTHLY IN OCTOBER

SUBSCRIBE TODAY!

SEE PAGE 57



SPECIAL PRICE THIS ISSUE

DETAILED PLANS KIT PRICES WITH GUARANTEE \$788 PP

**Hundreds of Thousands of items!
Millions of Dollars of Merchandise!
often as low as 3¢ on the retail Dollar!**

"BUY GOVT. SURPLUS"

Sample of Reported Govt. Surplus Buys

- Tractor \$51.51
- Truck \$59.09
- Typewriter \$14.00
- Printing Press \$75.00
- Tape Recorder \$21.00
- Sound Projector \$14.00

**PLUS SCORES OF
OTHER SENSATIONAL
BUYS!**

- New publication listing govt. surplus offerings, new or used, single piece or quantity lots, often at give-away prices.
- Lists offers involving Hundreds of Thousands of items yearly.
- Tells you **How to Buy**—Where to Buy—All the details—Everything you need to know in order to buy from the U. S. Government.
- Tells you how to **SELL** at nice profits materials that you buy from Govt. Surplus Sales.
- Lists directory of surplus dealers interested in good buys Govt. Surplus.
- Special easy to find tabulator tells at a glance where to locate items of specific interest to you.
- Complete lowdown on millions of dollars worth surplus being offered for sale, often at almost Give-Away prices.
- Fabulous Buys Possible—Terrific Profits Possible.

**"BUY GOVT. SURPLUS"
BOX 591-A, LYNN, MASS.**

**SOME OF THE ITEMS OFFERED
FOR SALE BY THE U. S. GOVT.!**

- Tools
- Hardware
- Photo Equip.
- Typewriters
- Jeeps
- Buildings
- Radio Equip.
- Projectors
- Trucks
- Printing Press
- Boats
- Plumbing
- Office Equip.
- Films
- Motors
- Furniture

**Just \$3.00 Per Sub!
—Others Charge
\$25.00 Per Year!**

Just \$3.00 will pay for a 5 months subscription to this big bargain publication listing government surplus and all the plus features mentioned!

**Your \$3.00 Back if You Do
Not Find At Least \$50-\$100
Worth of Bargains in The
1st Issue You Receive!**
Government Offers Change
Quickly—Don't Delay!

Australian Tru-Flite

BOOMERANG

GUARANTEED TO RETURN!

\$200

Perfectly balanced and flight
tested. Rugged and dependable.
Ideal Game Room Trophy!

WE PAY POSTAGE Wt. 5 oz.
TROPICAL SALES, BOX 33-35K, Miami 33, Florida



\$\$\$ TREASURE \$\$\$

New translator metal detector finds
lost or hidden treasure, coins, gold,
silver, jewelry, relics. Profitable
bobby. New underwater metal de-
tector detects sunken ships, out-
board motors, etc. In 300 ft. of salt
or fresh water. Operates from a
boat. Scintillation counters. Many
other models. Free catalog.
GARDNER ELECTRONICS Dept. 6
2545 E. Indian School, Phoenix, Arizona



BUILD YOUR OWN TELESCOPE

TELESCOPE kits direct from manufacturer—Do-It-Yourself Projects
for Amateurs—many other optical kits. Free catalog.
ESCO PRODUCTS—Oakridge, N. J.

Shrinks Hemorrhoids New Way Without Surgery Stops Itch—Relieves Pain

For the first time science has found a new healing substance with the astonishing ability to shrink hemorrhoids and to relieve pain—without surgery.

In case after case, while gently relieving pain, actual reduction (shrinkage) took place.

Most amazing of all—results were so thorough that sufferers made astonishing statements like "Piles have ceased to be a problem!"

The secret is a new healing substance (Bio-Dyne*)—discovery of a world-famous research institute.

This substance is now available in suppository or ointment form under the name Preparation H.* Ask for it at all drug counters—money back guarantee. *Reg. U.S. Pat. Off.

PROTECT YOURSELF

with this Fountain Pen-Type POCKET

TEAR GAS

DEVICE... \$15 VALUE 38 Special Cal.

\$5.95

Additional shells 50c ea.

with 1 shell
For police or civilian
defense against robbers,
mohawks, etc. Causes no
permanent injury. Highly
polished heavy nickel
case with spring-steel
pocket clip.

SEND CHECK OR
MONEY ORDER. NO C.O.D.'s

Exp.
Cal.

Nickel Plated
Peerless Type

HANDCUFFS
\$15.00 value **\$7.95**
pr.

Deluxe leather
carrying case \$2.50

Registered Cold Distributors
Suppliers for
Official Police Equipment

PUBLIC SPORTS SHOPS, DEPT. S-1 11 S. 16th St., Phila. 2, Pa.

This product is not intended for sale in states or
localities which have laws forbidding their sale.

ELECTRIFY

PLAYER PIANOS
PUMP ORGANS

**YOU CAN QUICKLY END TIRESOME FOOT-PUMPING
With a Compact Low-Cost Lee Silent Suction Unit**



EASY TO INSTALL
FULLY GUARANTEED
1000's IN USE
write to

LEE MUSIC MFG. CO.
Box 595, Tujunga, Calif.



GIANT 30FT. \$2



Inflate to Giant 20 to 30 ft. diameter,
with air or gas. Flying Advt. visible
for miles. Terrific for attracting
crowds at Openings, Fairs, Roadside
Stands, Gas Stations, Sports Events.
Use at Water Gardens and Shows.
Made of genuine Neoprene Rubber
for extra durability. Never Used.
Orig. cost U.S. Govt. \$25.00. Limited
quantity. Special offer only \$2.00
each plus 50¢ each postage and han-
dling charge. (5 for \$10.00) com-
plete. 0 ft. size 50¢ ea. (2 for \$1.00).
10 ft. size \$1.00 ea. (5 for \$5.00).
No C.O.D.'s. Sold at fraction of cost.

NOVEL MFG. CO.

33 2nd Ave., Dept. G-3207
NEW YORK 3, NEW YORK

Cast your ballot for a successful future!

249 I.C.S. COURSES



I.C.S. is the oldest and largest correspondence school. 249 courses. Business, industrial, engineering, academic, high school. One for you. Direct, job-related. Bedrock facts and theory plus practical

application. Complete lesson and answer service. No skimping. Diploma to graduates.

Send for the 3 free booklets offered below and find out how I.C.S. can be your road to success.

ACCOUNTING

Accounting
Auditing
Cost Accounting
General Accounting
Junior Accounting
Practical Accounting
Public Accounting

ADVERTISING

Advertising
Magazine & Newspaper
Advertising

ARCHITECTURE

AND BUILDING
CONSTRUCTION
Architectural Drawing &
Designing
Architectural Interiors
Architecture
Building Contractor
Building Contractor with
Drawing
Building Estimator
Building Maintenance
Carpenter-Building
Carpentry & Millwork
House Planning
Lumber Dealer
Painting Contractor
Reading Arch. Blueprints
Reading Struct. Blueprints

ART

Advertising Layout &
Illustration
Amateur Artist
Commercial Art
Commercial Calligraphy
Fashion Illustrating
Figure Drawing & Painting
Magazine Illustrating
Show Card & Sign Prod'n
Show Card Writing
Sign Painting & Designing
Sketching & Painting

AUTOMOTIVE

Auto Engine Tune-up
Automobile
Automobile Body Rebuilding
and Refinishing
Automobile Electrical
Technician
Automobile Technician
Diesel Engines

Diesel-Gas Motor Vehicle
Engines
Gas Engines
Internal Combustion Engines

AVIATION

Aero-Engineering Technology
Aircraft & Engine Mechanic
Aircraft Mechanic
Aviation Engine Mechanic

BUSINESS

Business Administration
Business Correspondence
Business Law
Business Management
Business Management &
Marketing
Business Management &
Production
Business Psychology
Canadian Business
Management
Clerk-Typist
Commercial Business Practice
Condensed Business Practice
Federal Tax Course
Managing a Small Business
Marketing
Office Administrative
Engineering
Office Management
Professional Secretary
Programming for Digital
Computers
Purchasing Agent
Retail Business Management
Shorthand
Stenography
Typewriting

CHEMICAL

Analytical Chemistry
Chemical Engineering
Chemical Engineering Unit
Operation
Chemical Laboratory
Technician
Elements of Nuclear Energy
General Chemistry
Industrial Analytical
Chemistry
Industrial Chemistry
Professional Engineer—
Chemical

PULP AND PAPER

Paper Making
Pulp & Paper Engineering

Pulp & Paper Making

Pulp Making

CIVIL ENGINEERING

Bridge & Building Foreman
Civil Engineering
Construction Engineering
Highway Engineering
Mine Surveying & Mapping
Principles of Mapping
Principles of Surveying
Professional Engineer—Civil
Railroad Engineering
Roadmaster
Sanitary Engineering
Section Foreman
Sewage Plant Operator
Structural Engineering
Surveying and Mapping
Water Works Operator

GRAFTING

Aircraft Drafting
Architectural Drafting
Drafting & Machine Design
Electrical Drafting
Electrical Engineer Drafting
Electric Drafting
Industrial Piping Drafting
Junior Mechanical Drafting
Mechanical Drafting
Sheet Metal Drafting
Structural Drafting

ELECTRICAL

Elec. Appliance Servicing
Electrical Contractor
Electrical Eng'g (Power
Plant option—Electronic
option)
Electrical Engineering Tech.
Electrical Instrument Tech.
Electric Motor Repairman
Illustration Eng'g Tech.
Industrial Electrical Techn.
Power-House Engineering
Power Line Design and
Construction
Practical Electrician
Practical Lineman
Professional Engineer—
Electrical
Reading Electrical Blueprints

HIGH SCHOOL

Good English
High School Business
High School College Prep
(Arts)

High School College Prep

(Engineering & Science)

High School General

High School Mathematics

High School Secretarial

Modern Letter Writing

Short Story Writing

LEADERSHIP

Industrial Foremanship
Industrial Supervision
Personnel-Labor Relations
Supervision

MATHEMATICS

Mathematics and Mechanics
for Engineers
Mathematics and Physics
for Engineers
Mathematics and Physics
for Technicians

MECHANICAL

Industrial Engineering
Industrial Implementation
Junior Mechanical
Engineering
Mechanical Engineering
Professional Engineer—
Mechanical
Quality Control
Introductory Technical
Writing

PETROLEUM

Natural Gas Production &
Transmission
Oil Field Technology
Petroleum Production
Petroleum Prod'n Eng'g
Petroleum Refinery Operator
Petroleum Refining
Petroleum Technology

PLASTICS

Plastics Technician

PLUMBING, HEATING, AIR CONDITIONING

Air Conditioning
Air Conditioning with Draw'n
Air Conditioning
Air Conditioning
Domestic Heating with
Oil & Gas
Domestic Refrigeration
Heating & Air Conditioning
with Drawing

Heating, Drawing & Estimate

Plumbing, Drawing &
Estimating

Plumbing & Heating

Practical Plumbing

Refrigeration

Refrigeration & Air

Conditioning

Steamfitting

RAILROAD

Air Brake Equipment
Car Inspector & Air Brake
Diesel Electrician
Diesel Engineer & Fireman
Diesel Locomotive
Diesel Mechanic
Railroad Administration
Railroad Car Repairer

SALESMANSHIP

Creative Salesmanship
Real Estate Salesmanship
Retail Merchandising
Retail Selling
Sales Management
Salesmanship & Sales
Salesmanship & Sales
Management

SHOP PRACTICE

Bulldozing
Electric Welding
Foundry Practice
Gas and Electric Welding
Gas Welding
Heat Treatment of Metals
Industrial Metallurgy
Machine Shop Inspection
Machine Shop Practice
Machine Shop Practice &
Toolmaking
Metalworking Engineering
Technology
Physical Quality Control
of Metals
Practical Millwrighting
Reading Shop Blueprints
Resistance Welding
Technology
Rigging
Sawing
Sheet Metal Worker
Tool Design
Tool Engineering Technology

Toolmaking

Welding Engineering
Technology

STEAM AND DIESEL POWER

Combustion Engineering
Power Plant Engineering
Stationary Building Eng'g
Stationary Diesel Eng'g
Stationary Diesel-Electric
Engineering
Stationary Foreman
Stationary Steam Eng'g
Steam Engine Operation

TEXTILES

Carding and Spinning
Carding
Cotton Knitting
Cotton Weaving & Weaving
Dyeing & Finishing
Hosiery and Circular Knitting
Loom Fixing
Spinning
Synthetic Fabric
Textile Designing
Textile Engineering
Textile Mill Supervisor
Woolen Manufacturing
Woolen Manufacturing

TRAFFIC

Motor Traffic Management
Railroad Rate Clerk
Traffic Management

TV-RADIO-ELECTRONICS

Gen'l Electronics Technician
Industrial Electronics
Practical Radio-TV Eng'g
Radio Operating
Radio Servicing
Radio Servicing with
Practical Training
Radio & TV Servicing
Radio & TV Servicing
with Practical Training
Servicing Electr'n Devices
Servicing Sound Equip't
Practical Telephony
Telephony and Radio
Communications
TV Receiver Servicing
TV Technician

For Real Job Security—Get an I. C. S. Diploma! I. C. S., Scranton 15, Penna.

Accredited Member,
National Home Study Council

INTERNATIONAL CORRESPONDENCE SCHOOLS



BOX 84025G, SCRANTON 15, PENNA.

In Hawaii reply P.O. Box 418, Honolulu

Without cost or obligation, send me "HOW TO SUCCEED," the opportunity booklet about the field I have indicated below, and a sample lesson (Math.)

Name of the course in which you are interested _____

Your Name _____

Age _____

Home Address _____

City _____

Zone _____

State _____

Working Hours _____ A.M. to _____ P.M.

Occupation _____

Canadian residents send coupon to International Correspondence Schools, Canadian, Ltd.,
Montreal, Canada. . . . Special low monthly tuition rates to members of the U.S. Armed Forces.

NEW HOME-BUSINESS offers beginners BIG PROFITS!

"I Earn \$25⁰⁰ per Hour"*

Spray with Suede!

\$1 Worth of Materials Brings You \$18—You pocket the profits!

WHAT IS FLOK-KRAFT?

If you've ever touched real suede or velvet—you know how Flok-Kraft feels and looks. Now, at last this beautiful new 3-dimensional finish, developed after years of experience, can be sprayed on anything—transforming ordinary things into expensive masterpieces of beauty. You must see it to believe it, so mail coupon below and receive free samples.



*Here is Mr. J. F. K. with a few of the items he has sprayed with Flok-Kraft. He is now earning \$25.00 per hour (\$400 for 16 hours work) just showing companies how to spray new Flok-Kraft.

FREE SAMPLES—MAIL COUPON NOW!



Make old (even broken) radio and TV cabinets look better than new. Spray average size cabinet in 15 minutes with 34¢ worth materials and charge at least \$10.00.

COVERS AND BEAUTIFIES FABRICS, METALS, GLASS, PLASTER, WOOD, PLASTIC—ANY SURFACE! Huge profits are waiting to be tapped in this tremendous new field. Over 5,000 big profit uses. Spray lamps, figurines, greeting cards, signs, automobile accessories, shoes, hats, card tables, toys, furniture, draperies, ceilings, walls—anything! Flok-Kraft makes old, damaged and worn objects beautiful and valuable—makes new things worth more. You can even spray cheap butcher paper and make it look like velvet-suede, and sell it for gift-wrapping paper.



RECONDITION worn automobile interiors (doors, trunks, dashboards, seats, etc.) with Flok-Kraft. Just spray it on—looks like magic!

RAINBOW OF COLORS Amazing Flok-Kraft rayon and cotton fibers are now available in over 24 brilliant colors—even the amazing fluorescent "glow" colors that attract attention **START AT HOME—SPARE TIME** Here's a rare opportunity to own your own business. Start small spare time—add to your present income. Then, as your business grows, work full time—hire others in work for you. At first, do it all in your own home—a corner of your basement, garage, dining room, service porch or kitchen is all the space you need.

LEARN IN A FEW DAYS Almost immediately you can learn Flok-Krafting and start earning money. It's fun, fascinating we guide you with simple step-by-step instructions. No overhead, no expensive equipment, no experience necessary either.



600% profit possible just spraying figurines, toys—hundreds of other items with beautiful Flok-Kraft. Work at home—spare time!

WE FURNISH EVERYTHING YOU NEED

We offer to furnish you complete easy-to-understand instructions in addition to materials that enable you to start at once. All sent at our risk because we want to start new Flok-Krafters in every area.

HELP FILL HUGE GROWING DEMAND

Imagine, there is a possible 20 Million Dollars worth of Flok-Krafting to be done. Get your share! Be first in your area to fill urgent orders that come from stores, offices, homes, neighbors, gift shops, architects, auto dealers, etc. Learn how to get orders by mail order.

JOIN THESE MEN AND WOMEN who have already started. "Earning \$10,000 year from spare time start!" Mr. Haver, Ore.; "Got \$25.50 doing auto trunks in four hours—earned \$13 per hour!" J. G., Mo.; "Scammed with orders already!" W. F., Calif.; "Got \$100 job first day!" C. H. E., Md.; "Quick \$140 order from store—5 other orders in 4 hours!" H. G. R., Wis.



\$1000.00+ are earned by individuals each year spraying Christmas trees with colorful Flok-Kraft. Flok-Krafted greeting cards are big business. Buy regular cards and spray them at home—sell for twice your price.



ALL 3 FREE!

Just mail card below and receive ACTUAL USEABLE SAMPLES, BOOKLET of 50 HOME-BUSINESS OPPORTUNITIES and CONFIDENTIAL DETAILS—all sent free!

©1959

Coast Industries, Dept. X-8, Los Angeles 61, California

NOTE: This new kind of Coupon-Business Reply Postcard requires no stamp or envelope. Write your name and address clearly on the lines provided—then clip and drop in mailbox. Nothing else to do. When we receive it, we will rush FREE USEABLE SAMPLES, HOME BUSINESS BOOKLET and CONFIDENTIAL DETAILS to you by return mail absolutely free.

FREE!

Just write your Name and Address on Card—Cut Out—Mail. (Ignore printing on back). We pay postage.

CUT ON DOTTED LINE

YOUR NAME _____

ADDRESS _____

CITY _____ STATE _____

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 20991, Los Angeles, Calif.

POSTAGE WILL BE PAID BY—

COAST INDUSTRIES (Information Mailing Dept.)

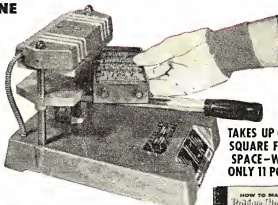
LOS ANGELES 61, CALIFORNIA

Dept. X-8

New Rubber Stamp Business Pays Beginners ^{UP TO} \$9.20 an hr.

START AT HOME IN SPARE TIME WITH THIS LITTLE TABLE TOP MACHINE

The multi-million dollar Rubber Stamp Business—once controlled by a few big companies—is now being taken over by small home operators—one in each community throughout the U. S. Men and women who have this inexpensive machine can turn out huge quantities of Rubber Stamps with special wording that buyers once were forced to order from big cities. Material costing only 27¢ makes a stamp that sells for \$1.80. The machine that does the work is simple and easy to operate and it turns out as many as six Rubber Stamps at a time each with different wording such as names, addresses, notices, stock numbers, prices and other "copy" needed by factories, offices and individuals. Working full capacity, it can earn as much as \$9.20 an hour for the operator! Now you can get into the big-pay business yourself with your own home as headquarters. You don't need any experience. We supply everything, including complete instructions and eight ways to get business coming in fast. Start making up to \$9.20 an hour from the very beginning. Cash in on the profitable Rubber Stamp business in your community right away.



**TAKES UP ONLY 2
SQUARE FEET OF
SPACE—WEIGHS
ONLY 11 POUNDS!**

NEW WARNER SUCCESS PLAN

Tell's How to Build—Step by Step—to Big Profits and Personal Independence. Read This Plan for Two Weeks Entirely At My Risk!

In this amazing Plan you will find exact and detailed instructions for starting a Home Business in spare time—without giving up your present job and without risking the loss of a single pay check. The Warner Plan shows you—with pictures, photographs and drawings—just how to make Rubber Stamps just as good as those turned out by the big companies. It shows how to get orders without canvassing or house-to-house selling. It shows you how to expand, how to get others to work for you and how to be SURE of at least twice the money you make on your present job for a life of personal independence.

But don't make any decision now. Read the Plan first—entirely at my risk. Then—after you have made a careful investigation—after you have talked things over with your family—only then do you decide what you want to do.

The thing to do now is to get full details which I'll send you FREE no salesman will call to urge you to buy anything. Mail coupon now—or just send a postcard—and I'll see that complete information goes out to you by return mail—postpaid.

**Cut Coupon
on dotted
line. Fill in
name and
address.
Drop in Mail
Box. NO STAMP
NEEDED!**

**110 PAGES
MORE
THAN
100
PICTURES**



**Here's what the new
WARNER PLAN Tells You
about Making Money
with RUBBER STAMPS**

● Read the complete and fascinating Rubber Stamp story in a big 110-page Book recently published by the Warner Electric Company. The book is profusely illustrated with more than 100 pictures and photographs. And you can read it for a full two weeks without risking a penny of your own money!

● **HOW TO** have fun now and at the same time provide for a secure and prosperous future.

● **HOW TO** check the advantages of operating a Rubber Stamp Business in your own community.

● **HOW TO** visualize the scope of the Rubber Stamp market.

● **HOW TO** make a Rubber Stamp (general outline).

● **HOW TO** get acquainted with the "Tools of your Trade."

● **HOW TO** make "Special" Rubber Stamps.

● **HOW TO** get the right price for the Rubber stamps you make.

● **HOW TO** figure costs so you will be sure of a substantial profit on all the work you turn out.

● **HOW TO** set up your workshop.

● **HOW TO** get the most out of Warner's "Eight Tested Sources for Getting Business."

● **HOW TO** get started on a cash outlay so small that you can get back your entire investment inside of two weeks.

RUBBER STAMP DIVISION, Dept. R-5-J
1512 Jarvis Avenue, Chicago 26, Illinois

FIRST CLASS

Permit No. 34316
Chicago, Illinois

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

Postage Will Be Paid By

RUBBER STAMP DIVISION

1512 Jarvis Ave. Chicago 26, Illinois

Dept. R-5-J

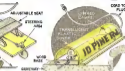
YOUR NAME _____
ADDRESS _____
CITY _____ STATE _____
ZONE _____

Double-Page Spreads

Parade of New Patents



Motorable Water Sled. Designed to be towed by a motor boat, this addition to the water sports family has an adjustable seat, a rudder controlled by pedals and two ropes which extend to provide a handhold for the rider. Patent No. 2,910,799 William A. Albright, designer to Albright Boat and Marine Co., Charlotte, N. C.



Transparent Delivery Curing is a boon to all those poor souls who—regardless of back-up lights—find it some too easy to back out their driveways. It also is handy to prove a great loan car and, with the owner's name and address painted on, a good addition to house or building identification. Patent No. 2,920,184, Wilton Kestler, Youngstown, Ohio.



Knockdown Beach Hold-all has interlocking ports and can be set up easily—then knocked down and tied in a neat package for carrying. It provides convenient supports and racks for drinking glasses, towels and slippers. Patent No. 2,924,359, Bruce C. Sharp, Phoenix, Ar. 1.

Electric Barkless Amplifier and missing sound with tinkling and provides its own draft. Just plug it in, put some barkless in, and barkless bark and separate the air bulbs to provide a constant draft. Patent No. 2,922,016 Harry L. Penninger, Berkeley, Calif.



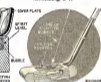
Self-Easy Suitcases should be of benefit to anybody who has to tote heavy luggage around when traveling. It has built-in retractable wheels of each end which can be let down for traveling, then retracted and folded far away of handling or storage during travel or at home. Patent No. 2,919,319, John Buckner, San Diego, California.

Self Rear View Mirrors can give motorists a better look at the traffic behind them. In this bifurcated model, one half serves the vehicles directly behind, while the other half can be separately adjusted to give the driver a clear view of the cars attempting to pass him. Patent No. 2,916,967, Alexander J. Huxek, Flint, Mich.

For more complete information on any of the inventions shown here, you may make direct of each original patent by sending your request with the patent number to Commissioner of Patents, Department of Commerce, Washington 25, D. C. Enclosure \$10 is paid for each patent.

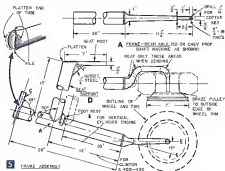


Metaphorical Bow has two sets of endless bells which are rotated in opposite directions by a small motor. Harmonic or fortissimo effects are obtained by varying speed with a rheostat. Patent No. 2,917,963, Lucerne Lechner, Brownsville, Jacksonville, S. A.

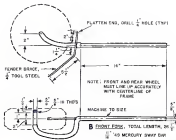


Position Pointer for Golfers has a highly level indicator and a directional arrow. The golfer stands so that a line down through the arrow point would pass through the golf ball, thus keeping the ball in view—ensuring him he will strike the ball correctly. Patent No. 2,919,523, Harry L. Sholly, Reno, Nevada.

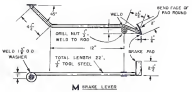
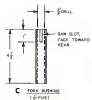




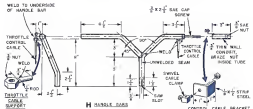
5 FRAME ASSEMBLY



5

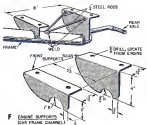
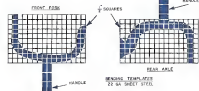
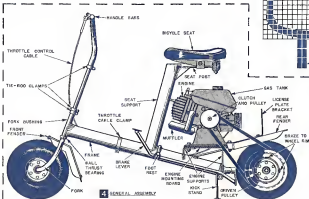


M BRAKE LEVER

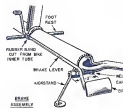


H HANDLE BARS

CONTROL CABLE BRACKET



F ENGINE SUPPORT (FOR FRAME CHANNEL)



N KICKSTAND

Simplest 3-Pointer Hasty Hydro

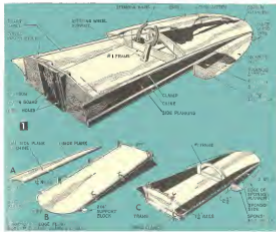
For a week's spare time and \$20, this speedy water sprinter can be yours

By WILLIAM D. JACKSON
Naval Architect

Craft Prior Project No. 308



The high speed of a 3-point hydro is possible because only a small portion of the aft end of the sponsons and extreme aft end of the hull at the transom reach the water.



WITH under-hull lines similar to those on the 150 mph world speed record breaking boats, this little craft will give you the most in speed and fun from your outboard motor.

Any outboard from 5 to 15 hp can be used and, although extremely fast (25 mph with 5 hp, 35-40 mph with 15 hp), it is not intended for rugged competitive racing in sanctioned N.O.A. or A.P.H.A. races. But, for the sheer fun of running circles around so called "speed boats" on your local small lake, it can't be beat.

Construction. To make certain you can cut all of the $\frac{1}{4}$ and $\frac{3}{8}$ -in. plywood pieces from two 4 by 8 ft. sheets, carefully lay out the outlines of all the pieces nesting them together as in Figs. 3 and 4. Layout dimensions for the transom are shown in Fig. 2. For a pencil guide when drawing the curved lines, use a $\frac{1}{4}$ x $\frac{3}{8}$ -in. strip of wood bent against small nails partially driven into the plywood. A portable electric jig saw will make short work of cutting all the plywood parts to shape. If you do not have such a saw, use a crosscut hand saw for the straight cuts and a key hole saw for the curved cuts. Be sure to cut the ship in the fore end of the decking and aft end of the sponson bottom pieces.

Now, using the $\frac{1}{4}$ -in. plywood transom piece as a pattern, mark and cut the transom frame pieces as in Fig. 3. Fasten them to the plywood transom with waterproof glue and 1-in. nails spaced about 3 in. apart and staggered.

Next, make the #1 frame from $\frac{3}{4}$ -in. lumber as in Fig. 3 and assemble with $\frac{1}{4}$ -in. plywood spacers glued and nailed to both sides of the frame. For chines and clamps (Fig. 4) rip a stock size 2 by 4 as in Fig. 5C. A combination circular saw blade should be used since a rip saw blade will cut too wide a kerf and reduce the size of the pieces. Lay out curved tapering fore ends on the chines and saw to shape with a hand saw. Set the clamps aside for the time being, and assemble the chines to the lower outside faces of the side planks (Fig. 1A). Use glue and $\frac{3}{4}$ -in. nails, and be sure to place the chines on opposite faces so that you have one right and one left hand side plank.

Hull Assembly. No building frame is required to assemble this 3-pointer. Begin by assembling the two side planks to the $\frac{1}{4}$ -in. plywood bottom plate in the upside down po-

STATEMENT OF USES

USES: Inexpensive way to build 3-point hydro

for noncompetitive racing and water sport use.

POWER: 5 to 75 hp outboard.

SPEED: 35 with 5 hp—35-40 with 15 hp.

LENGTH: 8'9".

BEAM: 34" at sponson, 34" aft of sponsons.

WEIGHT: 75 lbs. with steering gear.

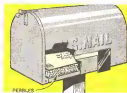
CONSTRUCTION: Plywood over wooden frame.



Ideas For Your Home



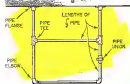
Replacement pencil covers clipped on clothes hacks will keep garments from falling off.



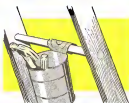
A layer of pebbles covering the bottom of a letter mailbox will keep the letters above the water line.



SHEET OF AGEKITE FOR WALL PROTECTION



Store long material on a rack made from lengths of water pipe and fittings. Mount to overhead joists with lag screws or large wood screws. Center frame keeps flexible material from sagging or supports shorter material.



A large juice can with the lid partly cut out, trimmed and bent as shown makes a handy portable container for tools and small parts needed for ladder jobs.



PIECE OF CHAIR TREAD

A piece of corrugated rubber chair tread placed inside the bathtub keeps soap holder from slipping. Just rinse under the water tap.



Tie a stout rope around the ladder near the end and pull down on endline to check the height of a tree or pole. If the ladder is frequently used for this work, nail the rope to the ladder sides.



A dusted aluminum pan or bottle cap, in many instances, is replaced to shape with a hammer. Used with a rubber cone or scratch tip, the modeling clay as an oval on which to rest the pan.



Shoes sprouting odors by holding a short piece of single line in the edge of the sole. Or, split one or two pieces of old linen down lengthwise and fit them in the soles.



Freshen your solid dust mop by boiling it in water to which you've added a tablespoon of soda and two of pumice. In the same water add ten drops of furniture polish.

More Ideas For Your Home



Use solder wire as a *lockdown-cutting* guide. Start with a right angle, then bend wire to outline obstacles such as odd-shaped corners and hallways. Place wire pattern as lockdown, trace, then cut out.



Make a *lockdown* treatment of 1" foam rubber. Add a black border and rub it with plastic rubber, applying it directly from the tube after having stretched the tubule with a soft-hand pencil.



When a closet is not provided with an electric light, hang a child's toy or sportsman's electric lantern on a coat hook. It's easily turned on and off and the infrequently used batteries last quite a while.



Re-align a sagging screen door by screwing across the corner a straightened hair clamp and turning the thumb screw as needed.



If your rubber-covered dish drainer ages and sticks, clean and dry it, then apply a thin coat of white shellac to harden the rubber and keep it from sticking.



Warm air from a hair drier, directed from the side against charcoal briquettes will hasten grilling. The same idea works well with charcoal, charcoal and small shop fans.



Use a paint roller, immersed in warm soapy water, to soak wallpaper for removal. Pull off with the aid of a painter's broad knife.



Use a baby bottle brush to clean out those screw-socketed flower vases.



A bird ladder can serve as a handy fly sink. Fasten in place with screw eyes.



Use Dad's orbital portable electric massager, equipped with a hand-held pad, as a massager. It will stimulate circulation and relax aching muscles.



These images brought to you
by
The American Marketing Association